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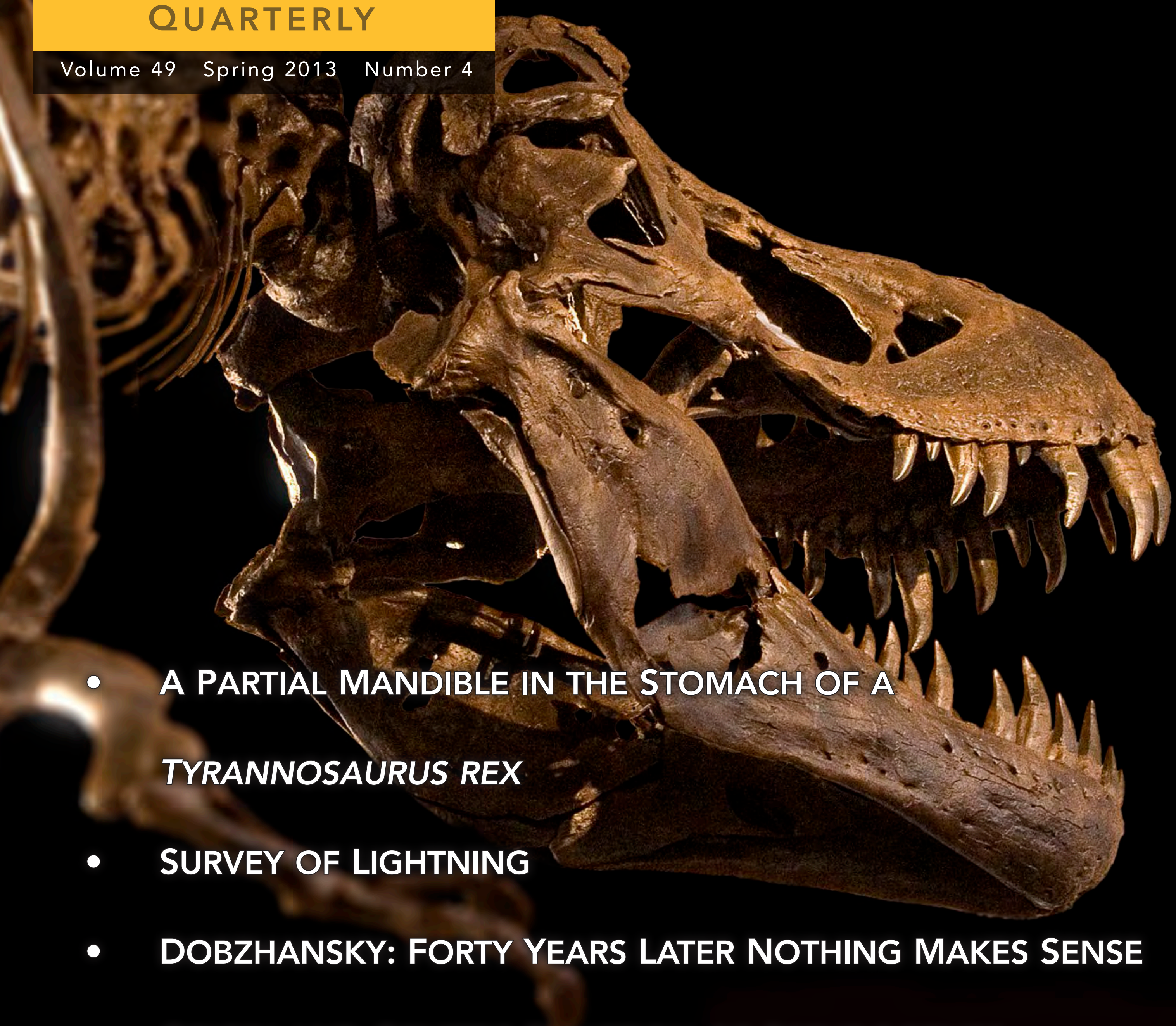

- A Partial Mandible in the Stomach of a *Tyrannosaurus rex*
- Survey of Lightning
- Dobzhansky: Forty Years Later Nothing Makes Sense
- Origin and Genetic Function of Pseudogenes
- East Coast Planation

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Haec Credimus

For in six days the Lord made heaven and earth, the sea, and all that in them is, and rested on the seventh.—Exodus 20:11

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Editorial

Thor’s Hammer

According to ancient Norse mythology, thunder and lightning was caused by the god Thor wielding his mighty hammer. Ancient Egyptians viewed the god Hapi as responsible for the annual flooding of the Nile River. Ancient Greeks attributed the light and heat of the sun to the god Apollo. In fact, many ancient civilizations worshipped numerous gods that were thought to be responsible for a wide variety of natural events: fertility, life, death, floods, storms, light, wind, rain. The actions of these “gods” provided explanations for phenomena that had no known natural cause.

As the understanding of these various phenomena progressed, natural explanations were gradually understood. Lightning was determined to be the result of electrical discharge in the atmosphere. In turn, thunder was the sound of the shockwave caused by the lightning rapidly heating the surrounding air. Lightning and thunder were merely natural events caused by natural phenomena. Thor and his hammer were no longer needed. Neither were Hapi, Apollo, nor all these other “gods.”

If these “gods” were not needed to explain basic natural phenomena, was any type of god needed to explain anything? Materialism sought to explain everything by natural mechanisms and physical forces. Anything and everything that has or will happen in this physical universe is the result of natural, predictable events. If these physical forces explain everything, then they also will explain the origin of everything. God is not necessary.

But, if these physical forces made everything, what was their origin? Obviously, they had to create themselves. Thus, the ultimate goal of materialism is to remove any hint of God’s presence from His creation by pretending it is all self-creating and self-sustaining. Therefore, the ultimate conclusion of materialism is that this physical universe “is all there is, was, or ever will be” (Sagan, 1980).

> Even many claiming to be Christians have failed to recognize the underlying materialism within arguments of evolution, age of the earth, abortion, homosexuality, and even popular biblical commentary.
>
> Like many of their nineteenth-century counterparts, they have accepted a materialist worldview.

Nineteenth-century Materialism

By the nineteenth century, there was eagerness by many to impose extreme forms of materialism on all aspects of scientific thought (e.g., Koestler, 1972, p. 30). Scientific progress was measured by its ability to free us from the Bible. Educated and civilized people needed to move beyond outdated ancient myths and superstitions such as God, creation, sin, and judgment. These superstitions needed to be replaced by a higher “intellectual” thinking. The nineteenth-century German philosopher Friedrich Nietzsche repeatedly declared that "God is dead, and we have killed him" because supposedly we had intellectually advanced to where we finally no longer needed God as a comfort or a crutch (e.g. Nietzsche, 2006, p. 90. Ironically, now that God was dead, Nietzsche argued for superficiality).

Creationists should never allow evolutionists to "win" the debate simply by definition.

It is irrelevant how the National Academy of Science, or any other organization, chooses to define the sciences (which will always be a very materialistic definition).

Published in 1830, Charles Lyell's *Principles of Geology* was highly influential with claims that geologic formations resulted from long periods of gradual changes, not short periods of catastrophes (such as floods). Bragging in letters, Lyell stated his desire to "free the science from Moses," expose "the mischief and scandal [theologians] brought on by Mosaic systems," and to rid us of "Mosaic geology" (Lyell, 1881, pp. 268, 271). He even referred to the idea of the "Mosaic deluge" as an "incubus" (Lyell, 1881, p. 328).

Charles Darwin took Lyell's *Principles* on his voyage aboard the *HMS Beagle*. Darwin considered Lyell's work to be of "infinite superiority" to the thinking of geologists at that time. He stated, "I feel as if my books came out of Lyell's brains & that I can never acknowledge this sufficiently" (Darwin, 1844). Thus, "Lyell's writings … became the hub of [Darwin's] later biological thinking" (Browne, 2003, p. 294).

In fact, Darwin admitted that when he initially boarded the *Beagle*, he did not "in the least doubt the strict and literal truth of every word of the Bible" (Darwin, 1888, p. 45). Unfortunately, Darwin had an insufficient understanding of the Bible, specifically Genesis. He incorrectly viewed biblical "kinds" to be species, failing to recognize that species is a man-made classification that was (and still is) very difficult to fully define or apply. When he began to observe the vast diversity in biology, he mistakenly assumed that it represented a range of species far too numerous to be created "kinds." They must have evolved/transformed from earlier ancestors. Hence, he gradually concluded that Genesis must be in error.

> For Darwin the *Beagle* proved the turning point of his life, a liberating journey through time and space which freed him from the constraining influences of Genesis … It is almost as if the elemental forces of nature … conspired together to fragment the whole framework of biblical literalism in Darwin's mind (Denton, 1986, p. 25).

Enter the "slippery slope." If Genesis is not historically accurate, what portions of the Bible are accurate? All too predictably, Darwin eventually determined that no part of the Bible was trustworthy. By 1880 he concluded "that I do not believe in the Bible as a divine revelation, & therefore not in Jesus Christ as the son of God" (Darwin, 1880).

However, Lyell "sold geology some snake oil," and his teachings "led to numerous unfortunate consequences, including the rejection of sudden or catastrophic events in the face of positive evidence for them, for no reason other than they were not gradual" (Allmon, 1993, p. 122). Even Stephen J. Gould (1975, p. 16) acknowledged that Lyell's critics "were much more empirically minded than Lyell." Trained as a lawyer, Lyell was not a geologist. Instead, of empirical evidence, Lyell "imposed his imagination" and relied upon "bits of cunning" to formulate "one of the most brilliant [legal] briefs ever published" (Gould, 1975, p. 16). Using syntax over substance, this "legal brief" sought to convince people that somehow by denying gradualism (regardless of the evidence, or lack thereof) they were rejecting science. By denying gradualism, they were imposing "religious" beliefs. With this conclusion, Lyell worked to establish the mentality that science can function only within a framework of materialism.

For over a century Lyell's influence dominated geology. Only in the last few decades have geologists begun to acknowledge Lyell's overly stated position and the huge impact of catastrophes in earth history (e.g., Ager, 1993). Yet, Lyell's heavy influence still lingers, in part because it provides a fertile ground for materialism. In turn, teaching of biological evolution thrives within a materialistic framework.

Thus, Darwin was overly impressed with weak assertions whose underlying motives were to deny biblical accounts of Creation and the Flood. Analytical evidence was not particularly important to these arguments. In addition, Darwin approached Genesis with a rather poor understanding, and when this was refuted, he leaped to the non-sequitur conclusion that this meant Genesis (thus the Bible) was wrong. Built upon this false premise, Darwin's works sought to construct a materialistic explanation for life (both its origin and diversity). As with Lyell's work, Darwin's supporters began to challenge that a rejection of his conclusions was actually a rejection of science (evidence notwithstanding). In many ways we have this attitude pressed upon us even more aggressively today (Anderson, 2012).

In their rush to demonstrate that we do not need Thor, Apollo, or other "gods," these nineteenth-century theorists sought to throw out everything that did not fit their materialist religion. Any link to or suggestion of creation or floods was too "religious." Despite evidence that the Washington Scablands were formed by a flood, this sounded too biblical to nineteenth-century geologists (Oard, 2004). Despite an absence of fossils showing appropriate transitions between major phyla (Raup, 1979), biblical "created kinds" was dispassionately rejected and common ancestry was unquestioned. Despite the complete lack of natural mechanisms (Anderson, 1989), a spontaneous origin of life was readily assumed as fact, shunning the "miserable presumption" that life was created (Huxley, 2006, p. 18).

Materialistic Science

Certainly materialism is not a new worldview. In the third century BC, Epicurus promoted a materialistic philosophy of self-indulgence. One of his first-century BC followers, Lucretius, argued that the physical world was all that existed. Yet, early scientists, led by pioneers such as Kepler, Boyle, and Newton, generally favored a theistic foundation for science's role in understanding God's creation. However, the nineteenth century marked a steady, even aggressive encroachment of materialism into scientific thinking, until, for many, materialism now defines science.

This materialistic version of science has expelled Kepler's "thinking God's thoughts," Boyle's "Incorporeal Agent," and "Newton's "necessary Being." Never refuted, Paley's "watchmaker" was unceremoniously replaced by a blind-chance mechanism simply because it fit within a materialistic framework.

> The old argument [of] Paley, which formerly seemed to me so conclusive, fails, now that the law of natural selection has been discovered … There seems to be no more design in the variability of organic beings, and in the action of natural selection, than in the course which the winds blows (Darwin, 1929, pp. 144–145).

Without adequate justification, by the end of the nineteenth century science had increasingly been defined by its alleged ability to replace God.

Ironically, many contemporary scientists and philosophers who would not consider themselves materialists have generally accepted materialistic definitions and suppositions. Even many claiming to be Christians have failed to recognize the underlying materialism within arguments of evolution, age of the earth, abortion, homosexuality, and even popular biblical commentary. Like many of their nineteenth-century counterparts, they have accepted a materialist worldview, often without even fully realizing what they are accepting. In turn, biblical teaching is held subordinate to this framework.

This brings us to the contradictory situation we now see in our political, academic, and judicial systems. Having removed God and installed a materialistic version of science, these institutions now tell us science does not need God. Natural mechanisms can account for everything. Yet, they insist that science is neutral toward the existence and activity of God. However, any idea or concept that includes God is automatically rejected as unscientific. Any claim that God is creator is unwelcome in the science classroom. Any connotation of God is regarded as unconstitutionally "pushing a religious agenda." This is hardly a neutral position.

Creationists have argued (sometimes to the point of exhaustion) that creation is no less scientific than evolution. If evolution is science, then creation is science too. Clearly, this view is not popular in contemporary scientific circles. Admission that creation has any semblance of being science is tantamount to admitting that there might be some evidence for creation. Thus, it might possibly even be true—a situation that is absolutely unthinkable (Anderson, 2012). Also, dismissing creation as non-science serves as justification for ignoring and marginalizing all creation arguments and challenges—a response that is certainly far simpler than actually trying to address these arguments. It also justifies discrediting and shunning creationists within the scientific community.

However, creationists should never allow evolutionists to "win" the debate simply by definition. It is irrelevant how the National Academy of Science, or any other organization, chooses to define the sciences (which will always be a very materialistic definition). It is irrelevant whether creation somehow fits within these limited and biased man-made opinions. From a scientific perspective, the *only* important consideration is which model explains the data better.

I am convinced that creation offers the far superior explanation. As the superior model, it provides the only correct scientific framework. Its superiority does not evaporate simply because the current popular definition of science is very materialistic. The evolutionists' insistence that it is not science (or even involves science) does not negate the evidence for creation or suffice as an adequate response to creationists' arguments. Good science explains the data regardless of whether that explanation is popular or contradicts the opinions of those whose heart is set against God.

Biogenesis

Materialists (usually atheists) occasionally have asked how I would respond to significant evidence that I realize strongly refutes creation. Initially I baulked at this question. It appeared that the intent was a bit of an ensnarement to see (1) if I did not consider evidence important or (2) if I would readily abandon my creationist position. Either answer seemed a trap.

I have now come to recognize this question actually offers a very fortuitous opportunity to exploit the weaknesses of materialism. I'll answer by pointing out the vast suppositions assumed by such a question but then acknowledge that such evidence would be a very strong challenge to my creationist position. As a scientist, I cannot ignore evidence that I accept and understand. I would counter, though, that no such evidence has ever been presented to me. So, I feel very scientifically secure in my position.

I would then challenge that I have a question in return. What would be their response to significant evidence refuting their view? They assume life originated by a natural, chemical process. Yet, there is not a shred of evidence that life could spontaneously originate by any known (or even unknown) physical means. All materialist proposals, such as the clay hypothesis, "deep-hot biosphere," or the autocatalysis model, are mere speculations for the natural origin of life. More appropriately, they are desperate guesses.

Instead, the evidence is clear: life arises only from life. That is the empirically verified position and is known as the law of biogenesis. There are no known exceptions. Maybe that is why it is called a *law*.

So, I will challenge them as to whether they are scientists that follow the evidence or, as I have always assumed, their position is just dogmatic faith. They have challenged me with a hypothetical "what if." I have challenged them with a "what is."

Such a counter challenge often catches materialists off guard and puts them into a defensive situation. They have only two responses: Either acknowledge the scientific deficiency of their position or try to offer some explanation for their position's lack of scientific veracity. (Actually, a third response is common: cold silence.)

Those offering an explanation may argue that the law of biogenesis only applies to today's environment. They suggest the ancient earth had a far different environment, which allowed life to arise. However, it makes little difference what atmosphere was present. In fact, it makes little difference what chemicals were present. No matter what atmospheric conditions, no matter what chemical conditions, no matter what source of energy, living systems have never been observed to spontaneously form. Thus, this argument appeals to nonexistent evidence—not a very scientific claim.

Their other explanation is to simply rationalize that because we do not yet know a natural (i.e., materialistic) mechanism for life's origin does not mean we will not someday determine such a mechanism. This, of course, is merely appealing to future research to explain all current opposing evidence. Science, especially the empirical facet of science, cannot appeal to possible future discoveries as a rebuttal. Science can only account for what is currently known and understood. So, to remain materialist, they have little choice than to hold a distinctively unscientific position and pretend their blind faith is not making them "religiously dogmatic."

God of the Gaps

Creationists are often accused of a "god-of-the-gaps" approach, where God is inserted as the cause of everything that we do not yet understand. However, I challenge that God is not substituting for events that we do not know. He is not serving the same role as Thor or Apollo.

Instead, God accounts for what we *do* know. We do know life does not spontaneously form. We do know natural processes cannot account for the extraordinary intricacy of the cell (Meyer, 2009). We do know that genetic mechanisms cannot account for the origin of flight, breathing, brain cognition, etc., (Anderson, 2012). As a scientist, I am a creationist, not because of what I do not know but because of what I do know. I was a far more committed creationist upon the completion of my formal education than when I began. In fact, discoveries over the past 10 years have only convinced me even more of the creationist position.

However, materialists insert *unknown* natural causes for events they cannot explain. They do not know how life could spontaneously form, but there must have been some unknown chemical reactions. They do not know how cells achieved their wonderful complexity, but it must have resulted from some unknown natural processes. They do not know how the human brain originated, but it must have involved some unknown transformations.

In fact, through the nineteenth and twentieth centuries, natural mechanisms for these "unknown" events were generally assumed to be on the verge of discovery. Their elucidation was almost a foregone conclusion. So, Darwin may almost be excused (sort of) for assuming natural processes could account for life's origin and diversity. Within the vacuum of understanding at that time, many things seemed plausible.

Yet, discovery of these natural processes has not only remained elusive but has slipped completely from view. Discoveries in the past decade have moved the materialist's needed mechanisms far beyond the horizon. Thus, scientists today have no excuse. Contemporary knowledge of genetics, cell biology, epigenetics, physiology, neurology, and biochemistry render such "unknown" mechanisms as mere dreams of delusion.

Ancient civilizations "invented" gods to account for events they did not understand. In turn, materialists have invented their own "gods" to account for phenomena they do not understand. Even if these gods are not supernatural, per se, they serve the same purpose as Thor and are just as mythological.

To replace God, humans seem to either view everything as a god or view nothing as god. Either way, their heart desires to replace the true God of the Bible, the true Creator of the universe. For Him, they substitute their own creator, be it chemistry, physics, or *unknown* forces.

Of course, God is not really replaced. His presence, His power, His authority remain as dominant and significant as ever. This is why the apostle Paul said that people who ignore God are "without excuse" (Rom. 1:20). God can never be ignored, never be replaced, and never be minimized. Attempts to do so only make people foolish (Ps. 14:1).

Kevin Anderson, Ph.D.
Editor
Creation Research
Society Quarterly

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A Partial Mandible in the Stomach Contents of a *Tyrannosaurus rex*

Robert Brown, Otis Kline, Darek Isaacs, Jack Cuozzo*

Abstract

A partial mandible was discovered in a mass of fossilized stomach matrix near an incomplete *Tyrannosaurus rex* skeleton found in Dawson County, Montana, in 2009. The dissection of the *T. rex* stomach contents revealed a partial mandible with a secodont, two-cusped last molar tooth in a damaged socket. The bone of the mandible was structurally damaged, but it was only mildly attacked by stomach acids, strongly suggesting the *T. rex* died shortly after eating the animal. Electron microscope analysis of the tooth enamel remaining on the partly digested specimen indicated it belonged to a small mammal. The stomach of the dinosaur was filled with fossilized mud and sand that protected the mammal's jaw from further digestion. This also showed clear evidence that the *T. rex* died by drowning. In addition, the electron microscope studies of the teeth suggest a slower-than-modern-day development of the mammalian dental enamel prisms.

Introduction

Dinosaurs have been explained, nearly exclusively, within the parameters of evolutionary paleontology. However, according to the biblical Creation model, mankind would have seen and interacted with dinosaurs. Therefore, within man's own history, we should be able to learn much about these creatures; surpassing the current offerings of evolutionary paleontology. Items like habitat, instinctual habits, predator/prey relations, etc. should be recoverable within man's written and oral history.

Obviously, seeking out man's eyewitness accounts of dinosaurs in our history is an avenue of study that evolutionary paleontologists would never consider. Their errant presupposition of dinosaur extinction 64 million years, before the origin of humans, precludes them from searching for historical accounts. This is a clear 'blind spot' in evolutionary research, and a clear advantage for Creation researchers.

In particular, this project was initiated by the idea of searching for Mammoth remains (assuming North American discovery) in dinosaur coprolite or, even better, fossilized stomach contents. This idea stemmed from multiple historic references that seemed to point to a dinosaur/elephant-kind predator-prey relationship. However, due to the rarity of stomach contents of carnivorous dinosaurs and the evolutionary grip on

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recoverable dinosaur remains, it was not a foregone conclusion that this study could ever materialize.

The reach of the young-earth Creation community has grown, and in direct relation to this project, the Glendive Dinosaur and Fossil Museum has made significant inroads to position itself to have access to high-quality dinosaur discoveries. This growth in the young-earth community has enabled creationists, using creationist models, to do their own research in a field dominated by well-funded evolutionists.

Our excavations did not find consumed mammoth remains, but it did find mammalian remains in the very first excavation. And even though evolutionists have grudgingly accepted mammalian and dinosaurian co-existence in recent years, they have not always done so. The evidence, which revealed itself so quickly in this study, suggests that a biblical starting point would have advanced dinosaurian knowledge by decades. This gives strong support for the view that adhering to the biblical time frame would greatly expedite scientific discovery.

The research also yielded unexpected evidence. The find suggests new ideas about animal development, and perhaps even animal longevity in a pre-Flood environment. This appears to be the first report of this information. We suggest this evidence represents new ways of thinking in which further research will need to be done to develop into testable hypotheses.

The Discovery

In 2009, the incomplete remains of a *Tyrannosaurus rex* were excavated from a plot of land in Dawson County, Montana. The legal description of the find is the south half of Section 8, T 14 N, R 56 E, Dawson County, Montana.

The geology of this area has a "Badland" designation. It consists of very steep, nearly barren areas characterized by nearly vertical escarpments, narrow ridges, isolated buttes, and deeply entrenched coulees. These areas were formed by the active geological erosion of soft, multicolored sedimentary beds of loamy sand, sandy loam, silt loam, clay loam, and silty clay. Slopes range from 15% to more than 100%. The subject fossil find was on the ridge where Blanchard, Dast, Dimyaw, and Lambert soils are found. The Lambert complexes contain steep slopes (8 to 45%) and shallow soils ranging from 10 to 20 inches in depth with cool season grasses. It also contains little bluestem (*Schizachyrium scoparium*), which could represent up to 30% of the plant community.

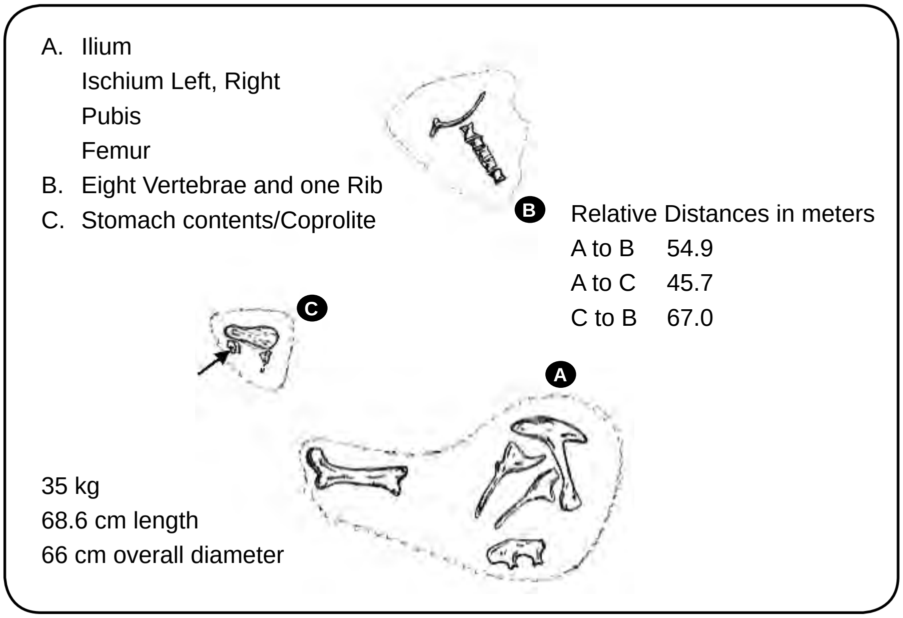
The little bluestem can exist in soils ranging from pH 5.0 to pH 8.4 (USDA Plants Database). Therefore, the soil is probably somewhere between pH 5 and pH 8.4. Overly acidic soil is detrimental to fossilization, whereas slightly alkaline environments are good for bone survival (Farlow and Argast, 2006).

Parts of the fossilized remains were four variously sized pieces of stomach contents, or possibly coprolites, listed (C) in Figure 1. Figure 1 is a map of the *T. rex* site and indicates the location of the pieces of stomach contents/coprolites in relation to the rest of the skeletal remains A and B. Relative distances between the three areas are listed in this triangle-shaped discovery. The easternmost piece in C (arrow) is seen below the largest piece and is an irregularly shaped mass in Figure 2. It measures 21 cm long × 13.5 cm high × 14 cm deep across the center. This piece is the focus of our research.

A small section of this irregular piece revealed a surface anomaly uncharacteristic of the rest of the remnant. Figure 3 shows it was approximately 25 mm long, triangular, and lighter in color than the rest of the mass. This triangular inclusion in the fossilized mass was carefully removed from the solid matrix using a Micro-Jack air scribe. It was discovered to be a partial right side of a mandible and a two-cusped, secondont-type molar tooth in its eroded socket (Figure 4).

Gut Contents or Coprolite?

It is important to understand that stomach contents of large dinosaurs are rare.



Relative Distances in meters	
A to B	54.9
A to C	45.7
C to B	67.0

Figure 1. Map location of *Tyrannosaurus rex* excavation (August, 2009).

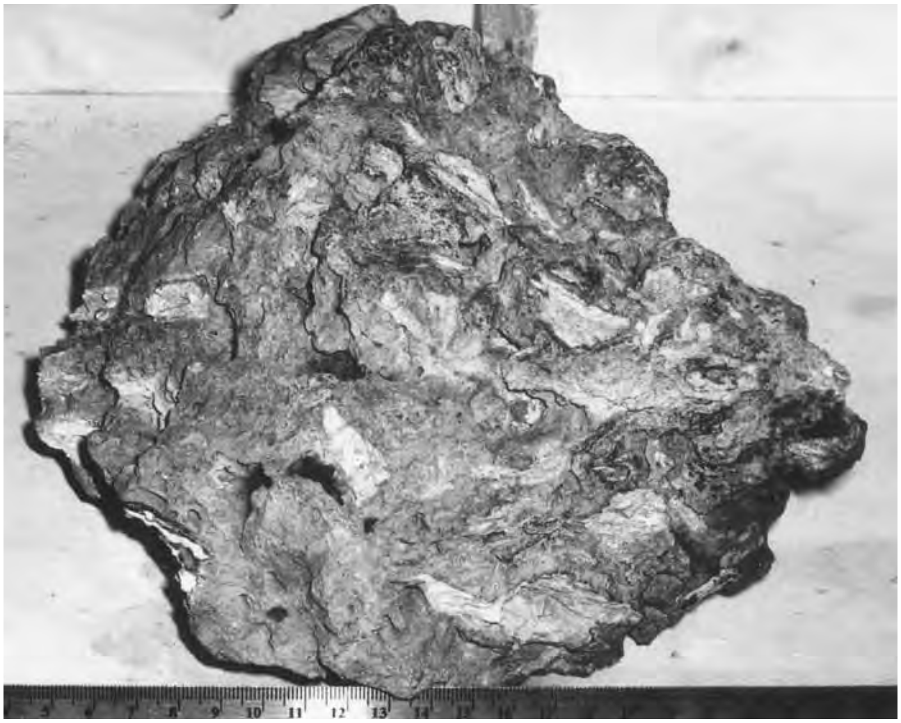


Figure 2. Stomach contents/coprolite.

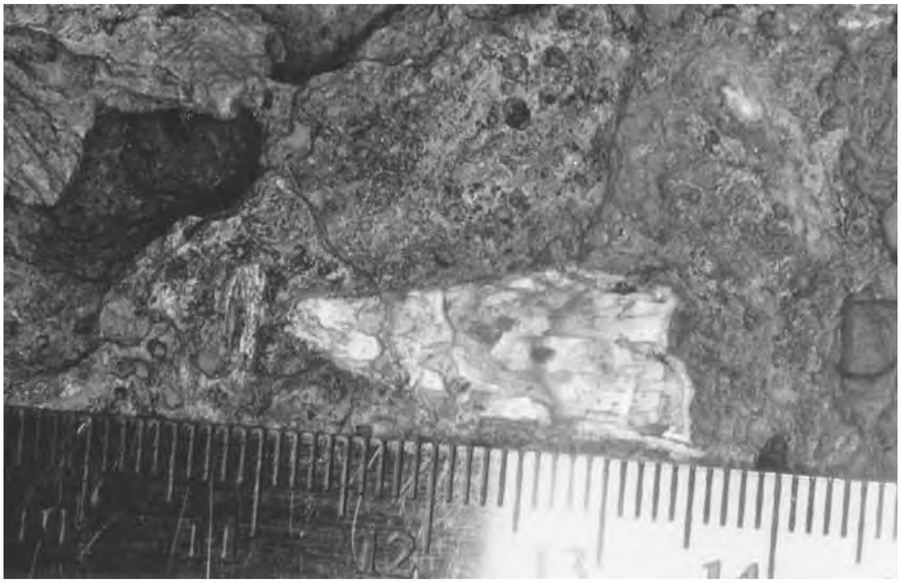


Figure 3. Triangular object of interest in mass.

Hone and Rauhut (2010, p. 236) stated,

> There are a number of well-preserved and articulated large theropod specimens that are known from around the world (e.g. *Allosaurus*, *Albertosaurus* and *Tarbosaurus*). It is rare for both large and small theropods to be preserved with bony stomach contents of previous meals, although a few are known, and in these, bones of considerably smaller prey than the predator seem to have been swallowed whole (e.g. *Baryonx*, *Compsognathus* and *Sinosauropteryx*).

They also concluded that there is no definitive evidence that these predators regularly ingested bone, which also makes this discovery important because bone was found in the remains.

In a landmark investigation of the gut contents of a Cretaceous tyrannosaurid, Varricchio (2001) described a partial skeleton of *Daspletosaurus sp.* from the upper Cretaceous (Campanian) in the Two Medicine Formation of Western Montana. This specimen yielded the first gut contents reported for a tyrannosaurid. There were also some vertebrae, a fragmentary dentary from a juvenile hadrosaur, and other hadrosaur elements.

All of these tyrannosaurid and hadrosaur bones fit within a 20-cm–thick blocky green claystone. The length and width of the discovery site was calculated from his map to be approximately 4.4 by 3.1 m. Varricchio (2001) suggests that these remains were deposited in a floodplain pond "quiet ephemeral waters" based on the presence of gastropods, *Physa*, and small bivalves.

The obvious difference between the present discovery and that of Varricchio's specimen is the slope, ridges, buttes, coulees, and escarpments and active geological erosion that characterize our area. It is extremely steep in places, and the downward movement of these bones is due to the topography. Remarkably, the *T. rex* remains stayed within a periphery of approximately 1300 square meters.

Important Questions

The first question when finding a matrix of fecal substances or digested materials in association with the skeletal parts of a dinosaur is: How close is the matrix to the bones?

The second question concerning our four solid conglomerate pieces of animal origin should be: Are the masses coprolites or pieces of stomach contents? It is

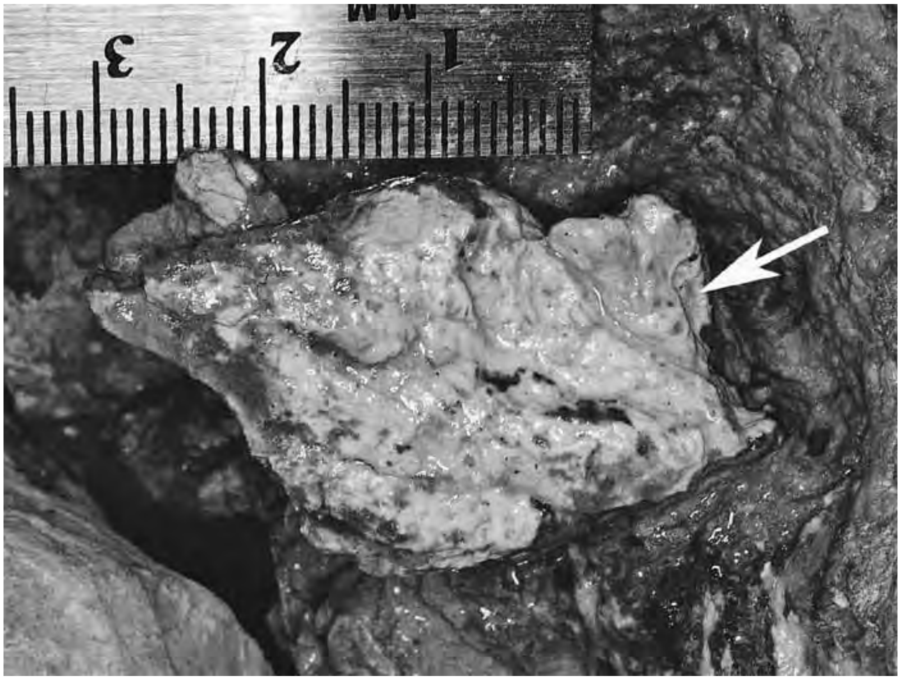


Figure 4. Lighter colored partial mandible and secodont lower molar are exposed in fossilized darker matrix. Note partial (damaged) mesial root (arrow).

important to note that the odds against this being stomach contents were very high with many more coprolites being found than gut contents (Varrichio, 2001).

It must be noted that Location C, the site of the contents/coprolite, was about 46 meters from the right femur. Therefore, do the waste products belong to the same theropod as the femur, and does a longer distance from the bones weaken their relationship? The admitted answer to the last question is yes. However, there are mitigating factors that affect the answer.

In 1995, a very large theropod coprolite (44 cm x 13 cm x 16 cm) was discovered by Sloboda and Tokaryk in Saskatchewan, Canada (Chin et al., 1998). It was found about 2 km south of the associated *T. rex* bones from a slightly higher elevation in the Frenchman Formation near the town of Eastend. We emphasize that these bones were over one mile away from the coprolite in question.

In their conclusions, the distance argument lost some of its persuasive ability due to four facts. The first is size of the mass, which is 44 cm long. The second is its phosphatic composition (Chin et al., 1998). The most diagnostic criterion of a carnivore coprolite is its phosphorous content (Hunt et al, 1994). Since the earth's crustal rocks normally contain only 0.1% phosphorus by weight (Beatty, 2001), concentrated phosphatic masses (higher than 0.1%) usually indicate a biotic mass such as a coprolite.

Third, Chin et al. (1998) point out that the configuration of the mass is consistent with irregular fecal deposits of very large animals. Fourth, the matrix contained 30% to 50% bone fragments, and this supported the contention that it was a fecally aggregated mass, and not a group of bones that just floated together. Therefore, the giant mass was confirmed as waste belonging to a *Tyrannosaurus rex*. In their deliberation about attributing the mass to a *T. rex*, Chin et al. (1998, p. 680) write:

> A few fossil faeces have been ascribed to herbivorous dinosaurs, but it is more difficult to identify coprolites produced by theropods because other carnivorous taxa coexisted with dinosaurs and most faeces are taxonomically ambiguous.

In other examples, two phosphatic coprolites, from Belgium (Bertrand, 1903) and India respectively (Matley, 1939; Jain, 1989), were close to 20 cm long and 10 cm wide and were accredited to dinosaurs but could have come from crocodilians or fish. Therefore, the definition of a phosphatic coprolite is crucial to our understanding of the differences between stomach and fecal material. Chin (2002, p. 43) explains that "significant concentrations of calcium and phosphorus in bone and flesh often favor the preservation of carnivore feces by providing autochthonous sources of constituents that can come from permineralizing calcium phosphates."

Therefore, it must be emphasized that the groundmass of most coprolites is phosphatic. Examining this closer, we find that the fossil record has more coprolites produced by carnivores than herbivores. This disparity may reflect that feces, generated by diets of bone and flesh, contain chemical constituents that precipitate out under some conditions as permineralizing phosphates. Even though the exact identity of a coprolite producer often remains unknown, the fossil feces can provide perspectives on prey selection, digestive efficiency, and the presence of previously unknown taxa in an ecosystem (Chin, 2002). All of these are very relevant to our specimen.

In fact, direct evidence, as explained by Hone and Rauhut (2010), can be ascertained from predator-damaged bones, coprolites, and preserved stomach contents. As an example, by using coprolites as the source, Chure et al. (2000) implied that theropods were not habitual bone eaters because of the rarity of bones that display obvious damage caused by theropod teeth. Tooth marks can be diagnostic when matched with actual theropod teeth. Other paleontologists have agreed with this conclusion (e.g., Hone and Rauhut, 2010).

Jacobsen (1998) examined 339 ceratopsid and 339 hadrosaur bones and found tooth marks on only 14% of the hadrosaurs and 5% of the ceratopsids. Jacobsen (1998) concluded the frequency of tooth marks on tyrannosaurid bones was lower than on the skeletal remains of the herbivores. But, we do see that theropods were eaten by other theropods.

Preservation

Even if the bones are not too damaged by the chewing process, a question still remains regarding the effect of stomach acids on the preservation of the bones. Would not the bone matter be digested, given a normal length of time in the stomach? It has been reported that in large living crocodiles that consume bony animals no recognizable bone fragments are passed from the body (Andrews and Fernandez-Jalvo, 1998).

This complete digestion is due to stomach acids. So, how can we explain the safe transport of our partial mandible through the digestive process of the tyrannosaurid? Due to the length of their gut, large theropods should have had long digestive times (Hone and Rauhut, 2010).

However, if the theropod died soon after feeding, then what effect would this have on the bony stomach contents? It has been determined in human digestion that a stomach would empty its contents four to six hours after a meal, under normal circumstances. Therefore, if a digestive system is filled with food during an autopsy, then it is reasonable to conclude death occurred relatively soon after a meal (Hess and Orthmann, 2010).

If we apply this to animals, though there would be some variation, we could safely assume that the discovery of undigested contents would imply that the creature did not die weeks after its last meal. Instead, the time frame would probably be less than a day.

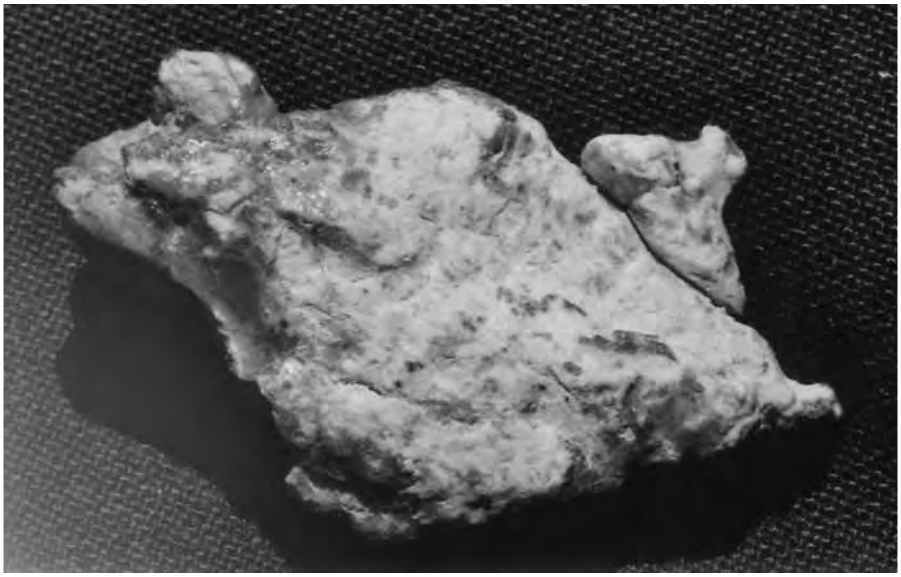


Figure 5. Lateral view of mandible and last molar (entire mesial root lost in preparation; mesial, right; distal, left). No alveolar buccal bone remains over the molar root.

Figure 4 reveals the exposed partial mandible (ramus) and molar tooth as seen from the buccal, or cheek, side. In this picture, we notice that the partial mandible and molar tooth had not yet been completely separated from each other or from the stony matrix. This suggests incomplete digestion.

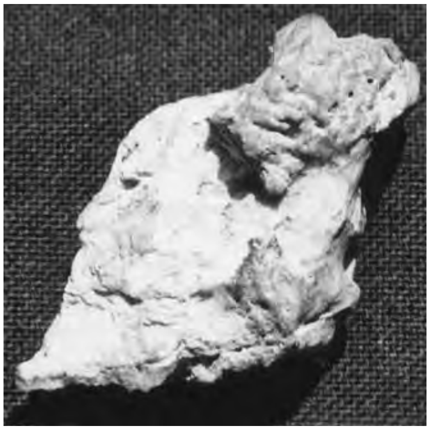


Figure 6. Lingual side of mandible without molar tooth (anterior, left; posterior, right). Some fossilized matrix protrudes (upper right) and still adheres to condyle area.

Mandible and Molar Tooth

Figures 5–10 show various views of the partial mandible and lower molar tooth that are pertinent to our study. Table I provides the measurements of the partial mandible.

In describing the mandible, it should be noted that it appears that the condyle has been displaced anteriorly by some molding force inside the *T. rex* stomach. We conclude this because there is no microscopic evidence of cracking or any break at its base, where it meets the main upper section of the ramus. If this is the true position of the condyle, it is very unusual.

There also appears to be some flattening on the upper mesial surface of the condyle. The posterior surface of

Table I. Measurements of Mandible and Molar[1,2]

1.	Ramus Height	32.30
2.	Ramus width (A-P)	24.27
3.	Ramus width (B-L)	10.21
4.	Body width (B-L)	8.58
5.	Crown length (M-D)	8.52
6.	Crown width (B-L)	2.27
7.	Tooth height	11.06
8.	Root length	7.28
9.	Crown height	3.78
10.	Root width (B-L)	2.55
11.	Root width (M-D)	unable to measure due to loss of mesial root

[1] Measurements are millimeters
[2] B-L =bucco-lingual; A-P = antero-posterior; M-D = mesiodistal

the ramus has been sheared off, probably by the *T. rex* biting motions, but no discernible tooth marks are seen on this surface of the bone. The posterior section of the condyle could have been chewed off.

There is a depression on the lateral surface of the ramus below the eroded position of the coronoid process. This seems to be a likely attachment area for the temporalis muscle. However, the medial portion of the mandible is

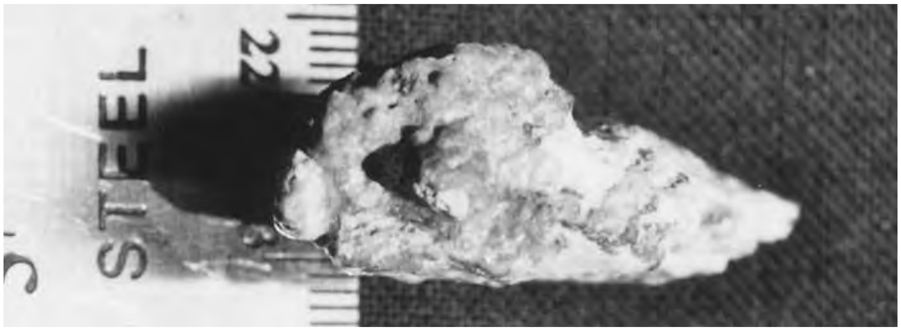


Figure 7. Superior view of mandible without molar (anterior, right; posterior, left; buccal, lower; lingual, upper—mm scale).

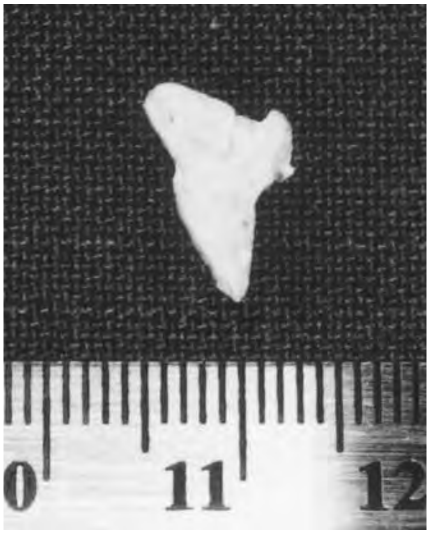


Figure 9. Buccal view of molar (mesial, right; distal, left). Distal cusp joined to mesial after fracture.

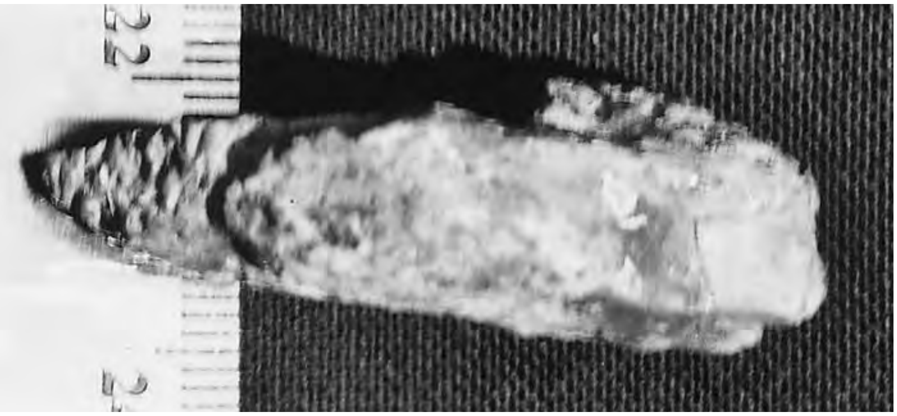


Figure 8. Inferior view of mandible and gonial angle (anterior, left; posterior, right; buccal, lower; lingual, upper—mm scale)

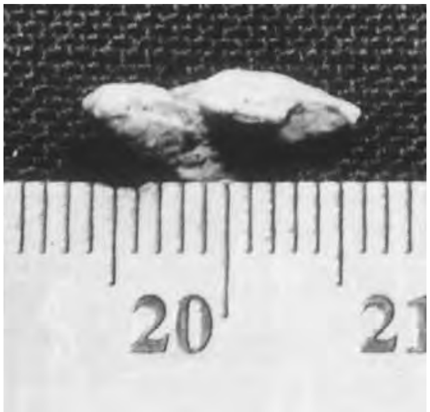


Figure 10. Occlusal view of molar (mesial, right; distal, left).

quite damaged, with some matrix still attached to the superior surface. It had to be left intact for fear of breaking of the entire condyle. There is a hint of the mandibular foramen just below the attached stomach matrix. Finally, on the sheared-off posterior surface, there is a brownish, hard, irregularly shaped 5 x 4-mm area that could be fossilized marrow. No attempt was made to drill into this brownish area.

The molar is a last molar, M2 or M3, and has almost no occlusal, or biting surface, wear. It appears as if it were in the process of eruption. This indicates it probably belonged to a young animal.

Energy Dispersive X-Ray

Energy Dispersive X-Ray (EDS) analysis was performed on all samples represented for determination of chemical composition. The analysis was performed on an initial qualitative basis for the purpose of elemental identification only. All samples were analyzed in their rough, untouched bulk form with no physical preparation except a carbon coating and a gold/palladium alloy coating for SEM imaging.

We present the physical elemental findings as an initial observation only. This qualitative analysis was done with the detector and calibrated against known standards. The system used these physical standards and not software-based theoretical assumptions for identification of the elements. Since the analysis was qualitative, the number of counts and the heights of the lines that identify the elements are subject to a number of parameters, which determine the ability of the line in question to be excited.

While some elements that are present in the sample have an effect on the ability of x-rays to leave the sample and be detected, there are other factors that play a role in the ability of the x-rays to escape the surface. The analysis was performed in a Hitachi S3400-N SEM (Hitachi High Technologies, California, USA) with a Bruker Analytical EDS system (Princeton, New Jersey, USA). To provide a more conclusive observation of elemental constituents, these samples would require further handling and polishing to provide a more accurate qualitative and subsequently quantitative x-ray microanalysis.

Molar and Bone EDS Analysis

Distal Cusp of molar

Figure 11 represents the EDS analysis of the enamel of the distal cusp, the hypoconid. This cusp could be any of three cusps of a talonid in a tribosphenic lower molar, but since there is no talonid basin and only two cusps, and this does not appear to be a tribosphenic molar, we will tentatively refer to it as the hypoconid. The analysis of this cusp indicates the presence of Ca, Na, Al, and Si within the sample. ANOVA analysis shows all peaks represented are statistically significant ($p \geq 95\%$). The presence of these elements in the enamel is not unusual. However, Phosphorus (P) is missing in

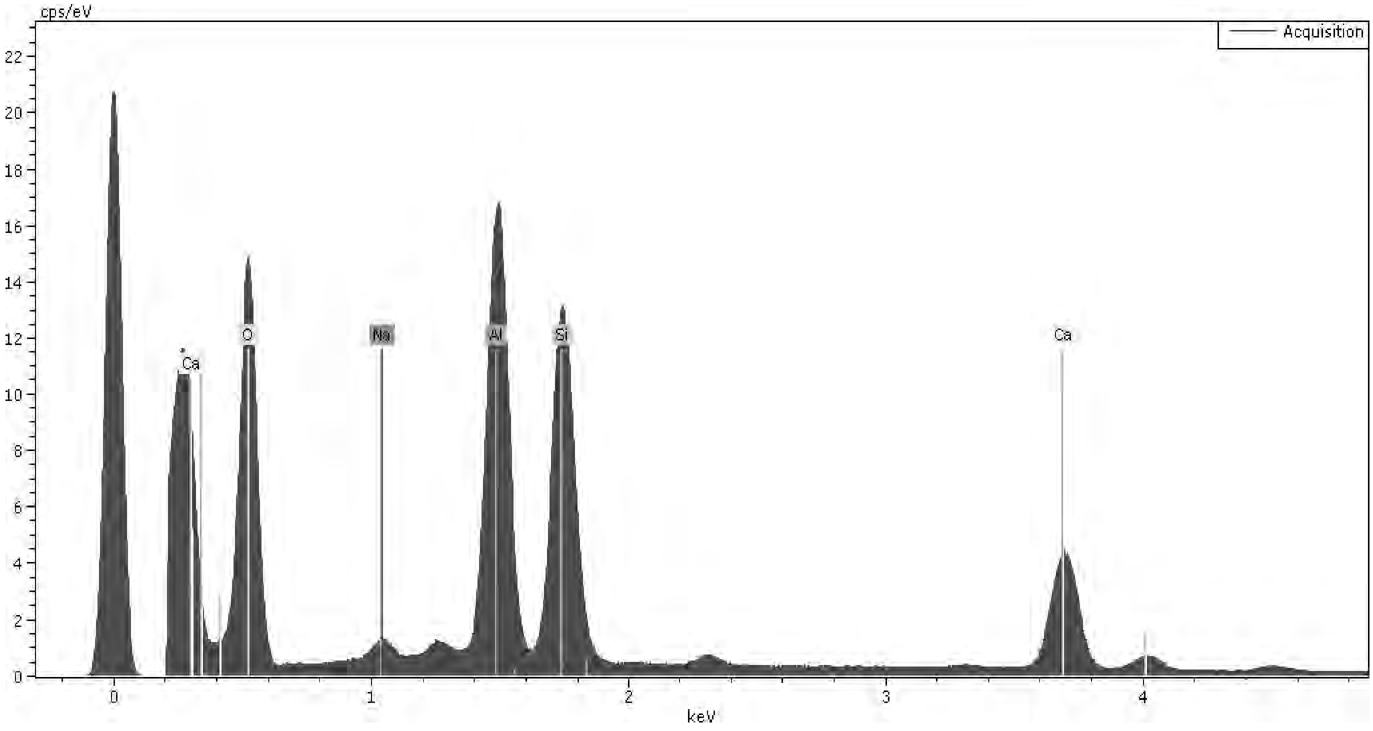


Figure 11. Enamel of distal cusp of molar.

the phosphate portion of the enamel crystal, which is unusual.

Fully formed enamel is the most highly mineralized extracellular matrix known, consisting of approximately 96% minerals and 4% organic material and water. The inorganic component consists almost entirely of calcium phosphate minerals in the form of apatite. Apatites in enamel are in a crystalline (rather than an amorphous) form.

The formula for the inorganic portion called hydroxyapatite is $Ca_{10}(PO_4)_6(OH)_2$. There are also trace elements in enamel, such as sodium and aluminum. Figure 12 and Figure 13 represent elemental analyses of two separate regions (A and B) on the buccal bony surface of the ramus of the mandible. Again the presence of Ca, Na, Al, and Si is observed. These findings were consistent with that of the

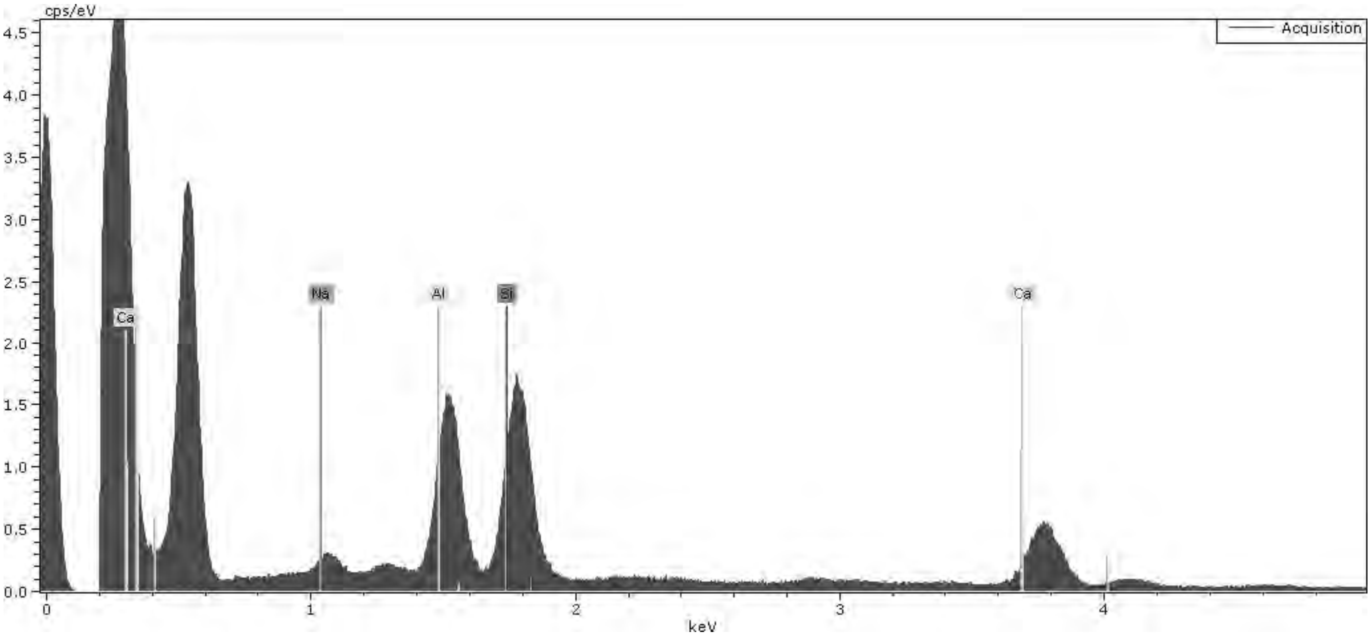


Figure 12. Lateral surface of ramus of mandible, Location A.

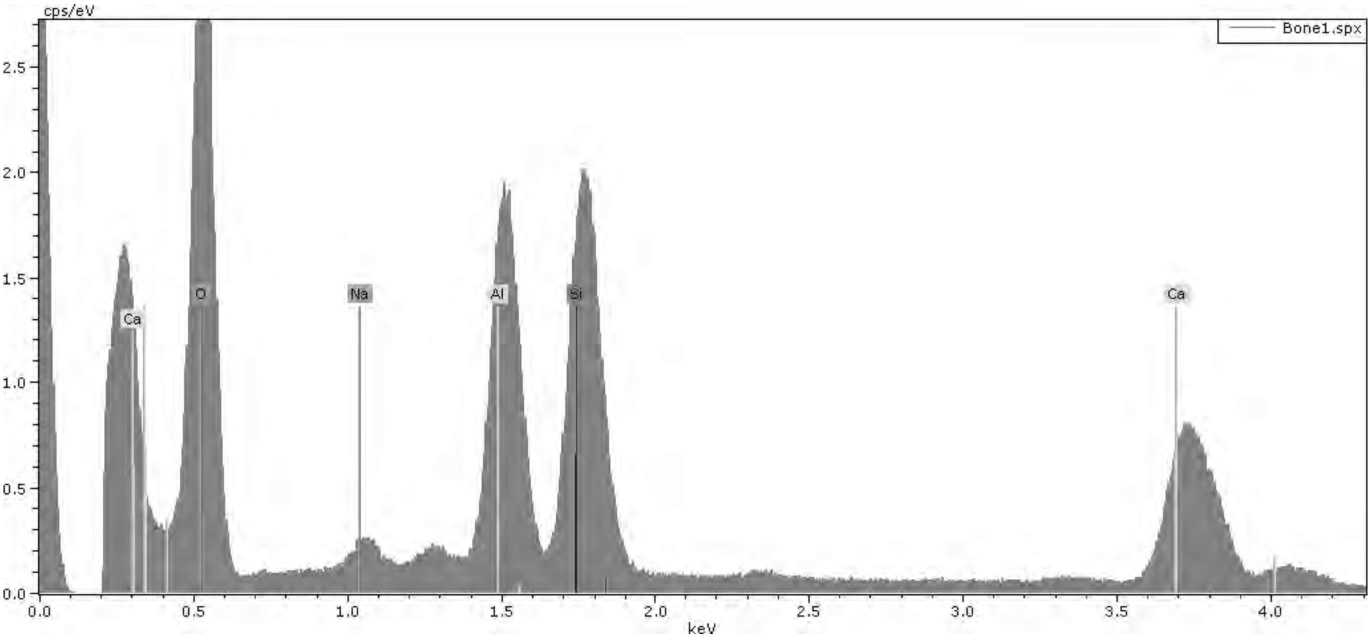


Figure 13. Lateral surface of ramus of mandible, Location B.

molar enamel. Again, ANOVA analysis found that all peaks represented are statistically valid (p ≥ 95%).

Figure 14 shows an overlay between Figures 12 and 13. Slight variations in the positions of the subsequent peaks are most likely due to the variations in topography within the analytical site.

Figure 15 presents a composite overlay of all three figures, 12, 13, and 14, to show the similarities between analytical composition. These would be the tooth enamel and both bony surfaces A and B. It should be noted that in this graph, while the samples were not scaled in comparison to one another, the differences in relative counts/sec are based on the topography of the individual samples relative to the detector and its placement. There is no phosphorous (P) on these surfaces.

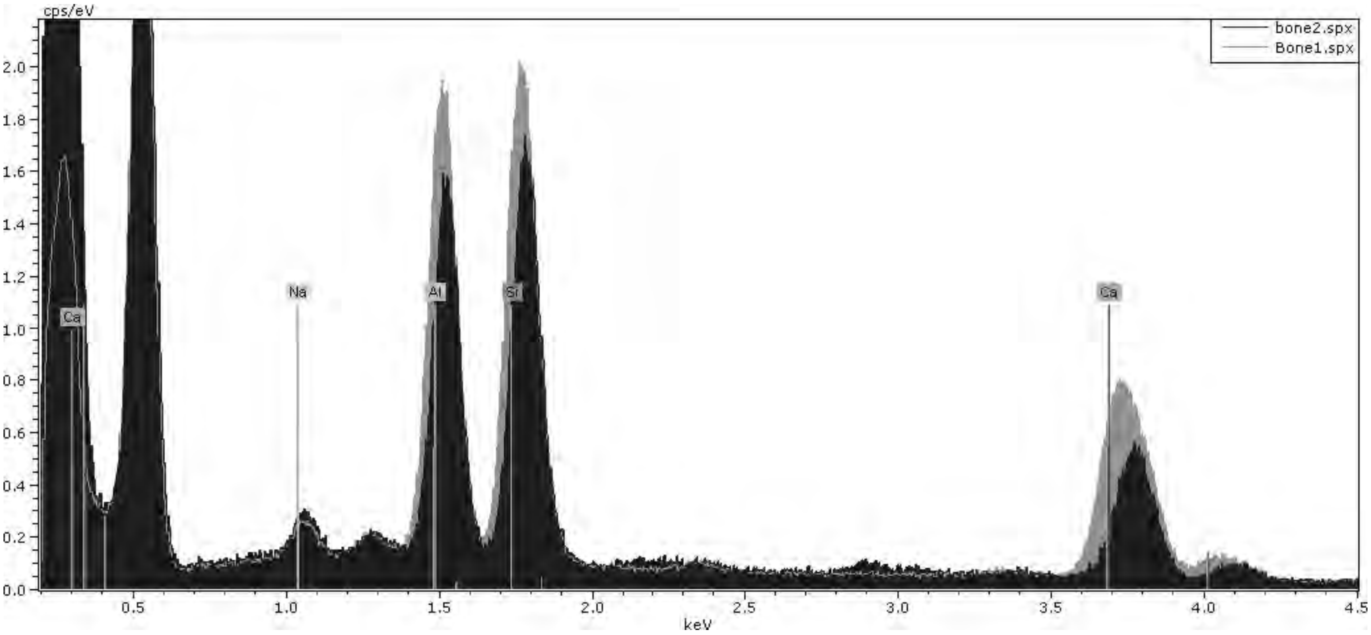


Figure 14. Both bony locations A and B on lateral surface of ramus.

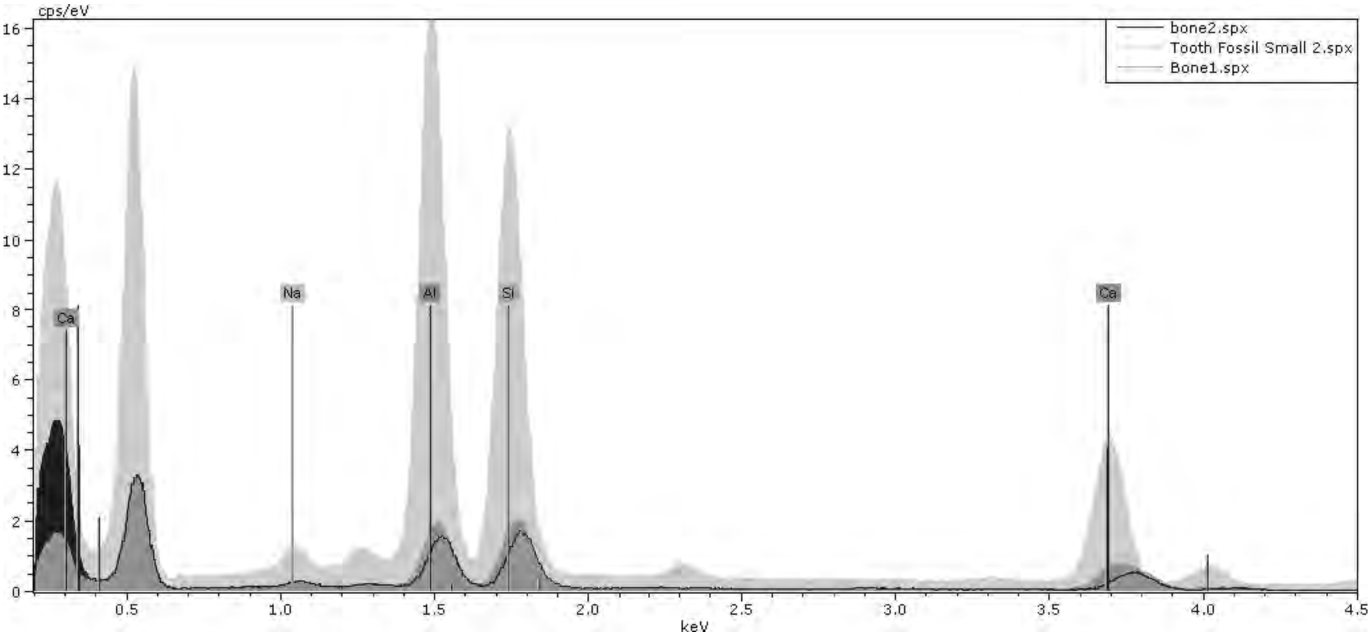


Figure 15. Composite of Figures 12, 13, and 14.

In Figure 16, a portion of the fossilized stomach matrix was analyzed from two individual locations around the location of the ramus of the mandible. Again, a qualitative EDS analysis shows that the chemical footprint is virtually identical to that of the bone and tooth represented in Figures 11 through 15. The only addition that is observed here is that there is a decrease in Al and the addition of Mg. While Fe is noted in this analysis, ANOVA analysis did not determine that its represented peak was statistically significant (p < 95%). The presence of Mg may be due to the surrounding environment and/or the substitution of Mg for some of the Ca (Kohn et al., 1999). Note once again the absence of P.

Figure 17 represents the qualitative analysis of a fragment of bone taken

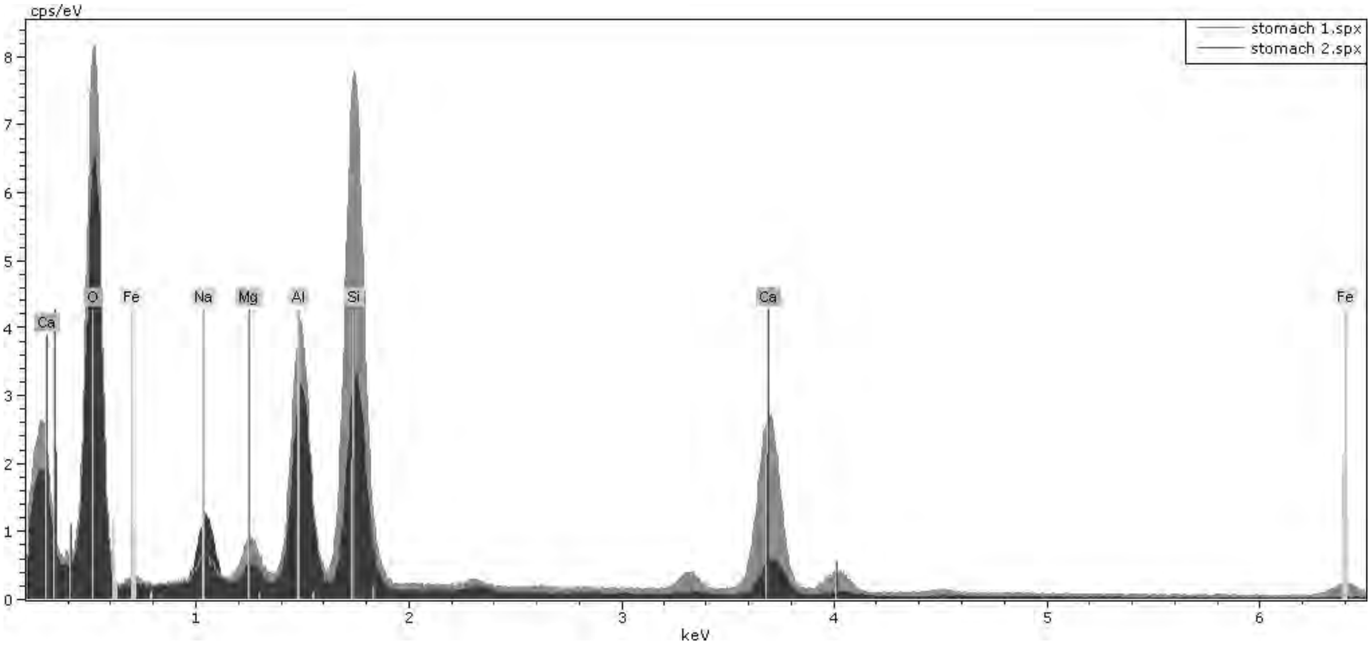


Figure 16. Fossilized matrix around bony matrix in two locations.

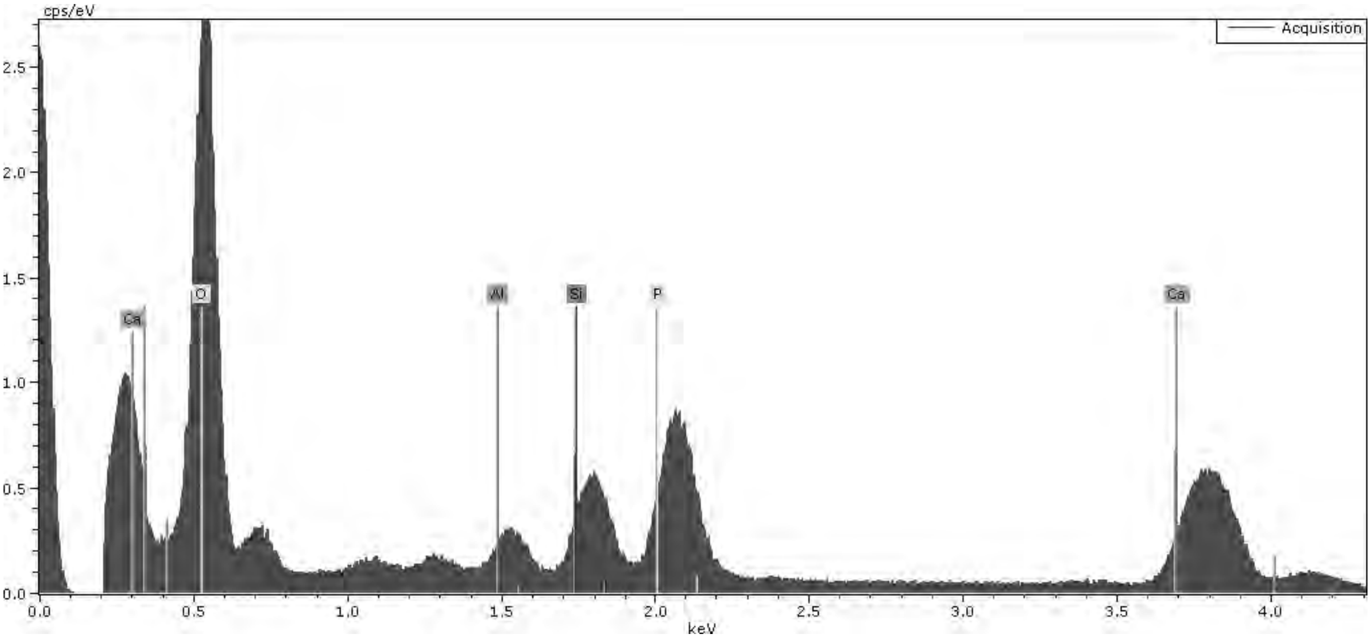


Figure 17. Fragment of right femur of *Tyrannosaurus rex*.

from the *Tyrannosaurus rex* right femur, found at location A in the Figure 1 map. The usual presence of Ca, Al, and Si are seen in this analysis, but there are two new occurrences: the absence of Na and the presence of P. Note that this is the first time P has been present and Na absent. As noted above, the phosphate (PO_4^{3-}) component of teeth and bone is a major part of the hydroxyapatite structure. Furthermore this sample was found approximately 45 meters from the stomach contents.

Figure 18 presents a composite overlay of two locations of the three observed on the *T. rex* bone. It is noted that the chemical composition of both locations are virtually identical, with the exception of the count/sec ratio due to topographical variations within the sample.

Analysis of Results

Are the elements in the enamel, mandibular bone, and femur bone indigenous to these biological entities, or are they the result a process called diagenesis? Diagenesis is the physical, chemical, and biological environmental processes that can modify an organic object's original chemical and/or structural properties. Molleson (1990, p.347) stated:

> Concentrations of certain elements in fossils can be very different from their initial concentration in bone. This may be the result of either a high concentration of these elements in the burial environments or due to preferential deposition of the elements into the bone … Apatite is host to many substitutions by cations, anions, and anionic radicals that resemble its normal constituents in size and charge.

Even teeth are not immune to diagenetic processes. For example, Kohn et al. (1999) state that apatite crystals in enamel are not immune to chemical alteration, despite enamel's lower original organic content and porosity.

Also, it is crucial to have some understanding of the effects of the digestive process of the *T. rex* stomach acids and to understand the effects of reposing in mineral-laden soil for thousands of years. Certainly these combinations could be the reason for the elemental peaks seen in the above figures.

The first questions are: Why is Na not present in the *T. rex* femur, and why is there no P in both the tooth and mammalian bone? Parker et al. (1974, p. 1317) provide some data relevant to that question.

> In fossil bone and dentine the sodium content is much lower (0.15–0.41 wt.%) than in corresponding modern samples while there appears to be no significant difference between modern and fossil enamel in most instances. The lowered sodium content in fossil material appears to be attributable to diagenetic removal. The physical properties of the bone have a strong influence on the amount of sodium removed.

Lambert et al. (1985, p. 477) added that "calcium and sodium may be lost through leaching but may be useful in the dietary context."

Dumont et al. (2009) found Na in the fossil bone apatite in a femur of a sauropod from Tanzania in their EDX maps. So, we conclude it is not ideal, but neither is it unreasonable, that no Na is found in the *T. rex* femur.

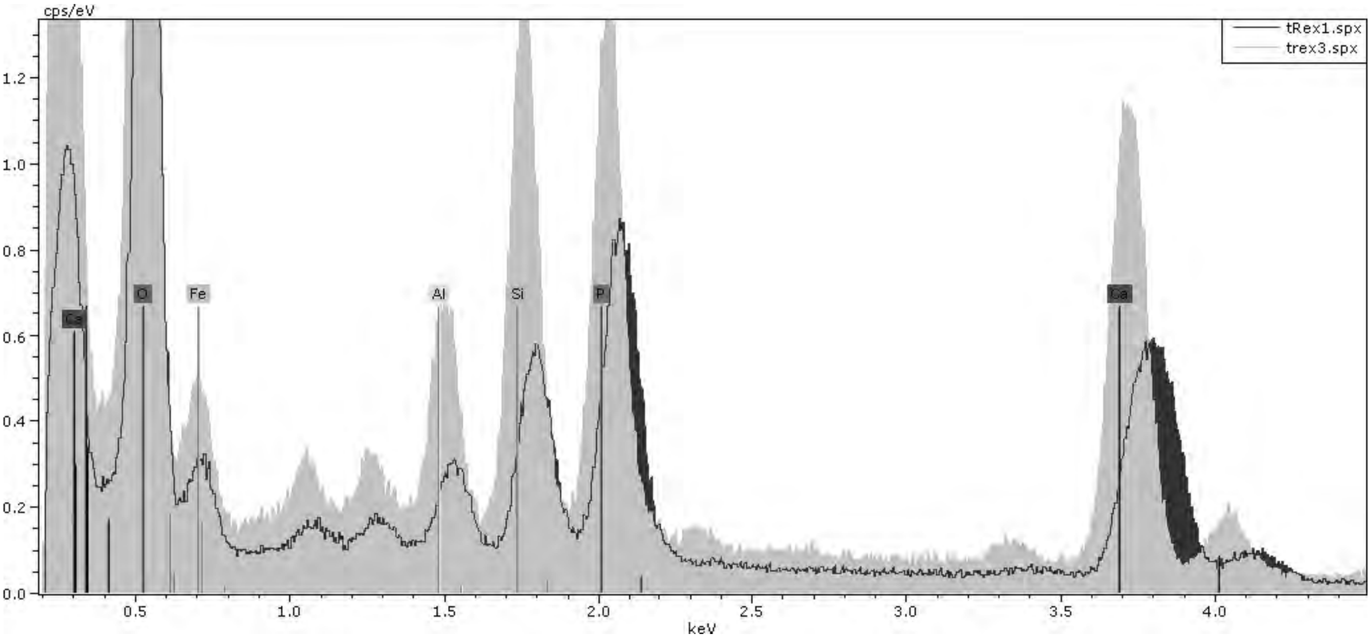


Figure 18. Composite of two of the three locations observed on the *Tyrannosaurus rex* right femur.

Another factor that enhances chemical or bacterial diagenesis is the effect of chewing by the gigantic *T.rex* jaws on the bones of this small animal. Chewing opens up more surface area to the diagenetic processes and allows it to work faster.

Although this bone must have been chewed some, considering the loss of almost the entire left side of the mandible, it is not unreasonable to assume it was swallowed quickly or gulped, because there are no characteristic *T.rex* tooth marks on the small mammal mandible. Basically, it just appears damaged on its surface.

What happened to the phosphate in the mammal tooth and bone? Hillson (1986, p. 108) wrote that "there are other departures from pure hydroxyapatite in calcified tissues." Hillson is referring to water-containing minerals percolating through the minute pores of buried skeletal material. This would also apply to buried fecal or stomach content material. He continues by stating that "common substitutions are sodium or strontium in the place of calcium, orthophosphate, carbonate or bicarbonate instead of phosphate, chlorine or carbonate in the place of hydroxyl" (Hillson, 1986, p. 108).

Furthermore, additional ions and molecules may be adsorbed onto the surface of apatite crystals. The solubility of apatites seems to depend on the pH of the environment. So we understand that excessive acidity (low pH) would dissolve the tooth and bone, while alkalinity would preserve it.

Therefore, how is the phosphate portion of apatite leached in an alkaline environment unless it was first acidic? This burial is probably best described in two phases. Phase I was in a very acidic reptilian stomach, but phase I was brought to an abrupt halt; otherwise the mandible would have been completely digested as seen in the digestion of modern crocodiles (Andrews and Fernando-Jalvo, 1998).

Then phase II began, and the mass alkalinized due to some ancient environmental conditions, including the influx of mineralized water percolating through the stomach contents. Also, there had to have been some selective leaching of the phosphate out of the hydroxyapaptite crystals of the mandible and tooth.

Several scientists have reported the ability of different bacterial species to solubilize inorganic phosphate compounds, including hydroxyapatite and rock phosphate. Strains of *Pseudomonas*, *Bacillus* and *Rhizobium*, demonstrate this ability (Rodriguez and Fraga, 1999). Phosphate solubilizing microorganisms are largely fungi and bacteria, which can exist on phosphorous-containing compounds (Goud et. al., 2008).

It seems reasonable to conclude, then, that postmortem bacterial overgrowth solubilized the phosphate in the hydroxyapatite and had little to no effect on the calcium. The other possibility is the substitution of CO_3^{2-} for PO_4^{3-}. A study on red deer, in France at the Lazaret cave, suggests that carbonate increases during fossilization and substitutes for PO_4^{3-} at one site and for OH^- at another site (Michel et al., 1995). However the authors also state that these were only "slight structural and chemical changes considering their geological age" (Michel et. al., 1995, p. 145).

Mammalian Origin

The mandible has been determined to be of mammalian origin. The presence of Hunter–Schreger Bands (HSB, alternating light and dark lines in enamel) is sufficiently diagnostic in distinguishing mammalian from reptilian teeth. Furthermore, reptilian enamel is not comparable at all to mammalian enamel. All reptilian taxa, with the exception of the agamid lizard *Uromastyx*, are without prisms in their enamel (Sander 1999). Mammalian enamel contains prisms.

Two experts (M. Ross and D. Moeller, personal communication, July, 22, 2010) with whom we consulted, have suggested that this mammalian jaw be assigned to the group called multituberculates, an extinct group of early mammals that have been found in the same (evolutionary-assumed) time frame as the *T. rex*. However, this conclusion has a problem.

None of the multituberculates have bladelike lower molars (Anonymous, n.d.). They do possess bladelike premolars with serrations but no premolar is preserved in this mandible. Therefore, this rules out a multituberculate origin due to this preserved specimen containing a bladelike lower molar.

Carlson and Krause (1985, p.1) studied the enamel microstructure of multituberculate mammals, and stated:

> Our review of Late Cretaceous and early Tertiary multituberculates reveals remarkable consistency in ultrastructure type at the subordinal level. All of the 13 recognized ptilodontoid genera were examined; all but two (*Cimolodon* and *Boffius*) possess small circular prisms that are numerous and closely-spaced. Twelve of 20 recognized taeniolabidoid genera were examined; all but three … possess large arcade-shaped prisms that are few in number and widely spaced … All but one (*Viridomys*) of the seven genera currently classified as Suborder incertae sedis possess large, arcade-shaped prisms.

Figure 19 is the first of the SEM images showing the radial fracture in the mid-crevice section of the molar, exposing the inner surface of the distal cusp. Note the dark, undulating bands of fractured enamel prisms running from lower left to upper right—these are the HSB mentioned earlier. These wavy prisms produce greater resistance to variable directions of force on the biting surface.

The uppermost edge of the cusp is the occlusal surface. Here, there is usually only a thin layer of zone-free enamel in the crown surface (Hillson, 1986). And the occlusal surface in Figure 19

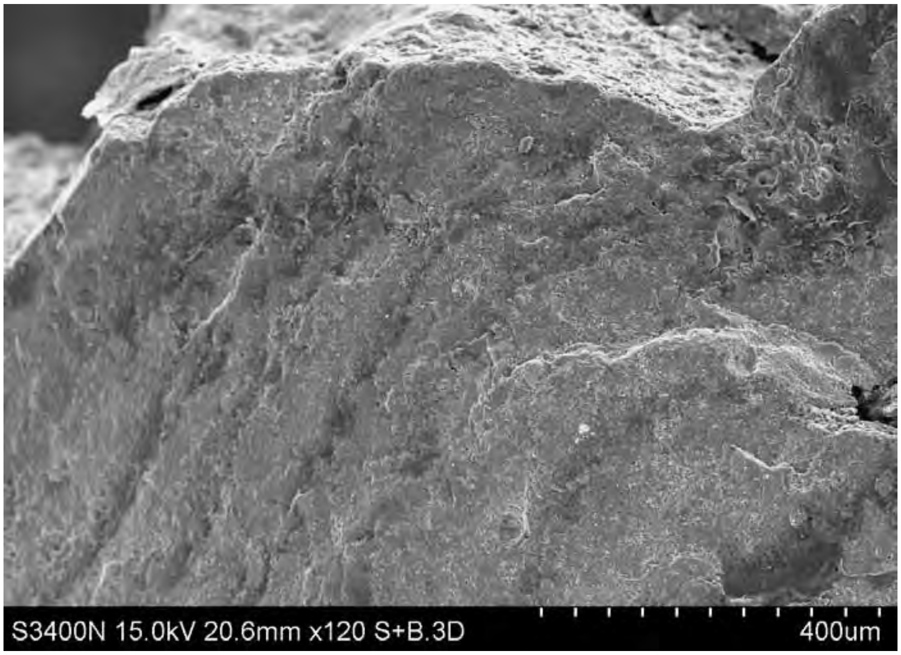


Figure 19. SEM image of radial fracture in mid-crevice of molar (magnification = 120x).

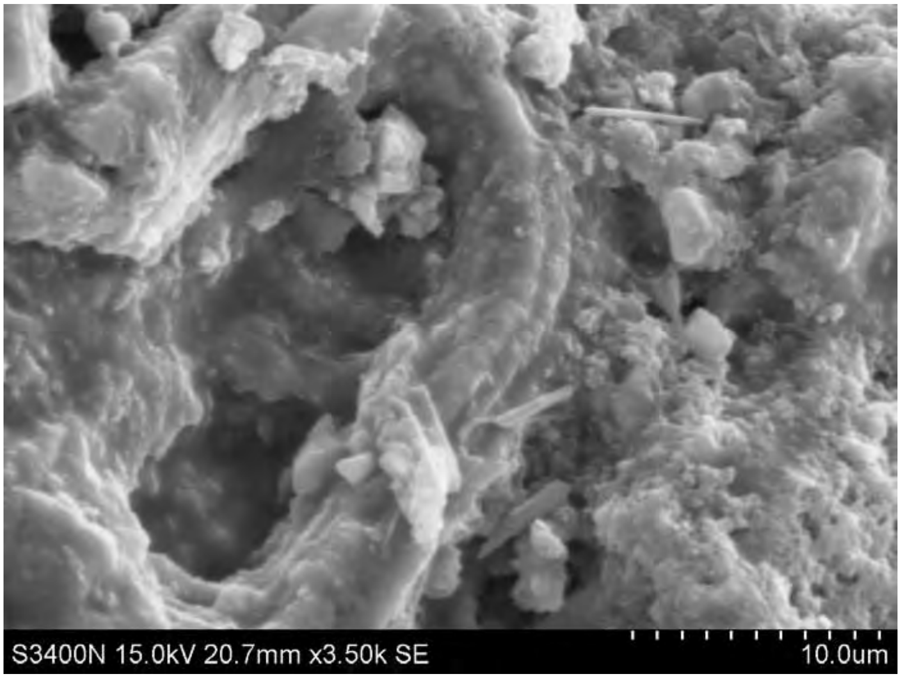


Figure 20. SEM image of curved enamel prisms (rods) arcade in shape and bound together. Broken ends are visible in upper left-hand corner (magnification = 3,500x).

appears to be mostly zone-free enamel.

In Figure 20 are the bundles of enamel crystallites called prisms or rods, seen in this oblong-shaped structure bound together by interprismatic enamel. In the upper left corner, two rods have been separated due to the enamel fracture, and two rods, the most superior and most inferior, are still connected to the bundle.

These broken ends of the rods are not circular but are arcade-shaped. Notice also the lumps or discontinuities in the rods. It is important to observe that the length of these bumps on the rods are about 1–2 µm in length.

In Figure 21, the wavy and terminally curved enamel rods are connected by sheaths and are twisted (decussating) in their form with individual discontinuities (lumps). This represents cyclical variation in the enamel matrix secretion rate (Hillson, 1996). The striations between the lumps have been called slower secretion or pauses in secretion. Based on human and animal observations, Hillson (1996) explains that these cross striations represent a 24-hourly or circadian rhythm.

In our research, if these small 1–2 micron secretions (lumps) are truly the amount produced daily, then each one of these represents a much slower rate of growth than what we see today.

This is an intriguing discovery because the modern average of 4.3 to 4.9 microns per day that was set forth by Bromage (1991) in *Macaca nemestrina* and mean rates per day of 4.70 ±0.73 to 5.12±0.60 microns per day for two species of *Sivapithecus* (Mahoney et al., 2007) are larger and imply faster enamel development.

Figure 22 shows that the decussating enamel rods are broken in places. Observe the horseshoe, or arcade, shape of the end of the partial rod in the uppermost left-hand side.

Figure 23 is a close-up of Figure 22. The interprismatic connections between the enamel rods that have a left-right direction in Figure 23 are called bridges of enamel. They are different than the interrow sheets of enamel seen in Figure 24. The interrow sheets of interprismatic enamel that connect the

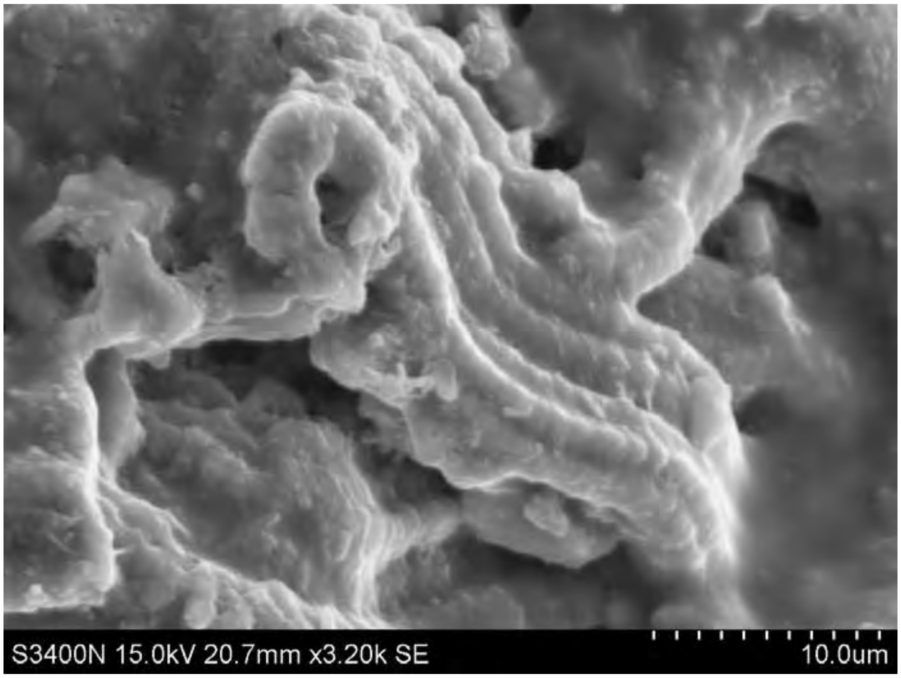


Figure 21. Twisted enamel prisms (rods) forming a woven, crystalline structure known as prism decussation. Note the bumps on the prisms. These are the "daily secretions" and much smaller than the modern-day 24-hour circadian secretions.

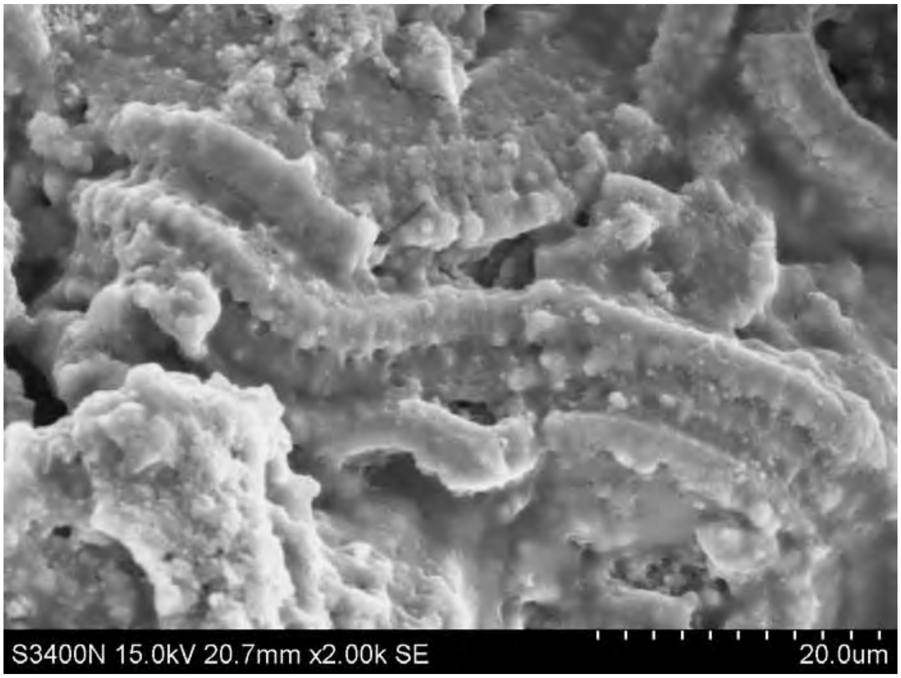


Figure 22. Twisted enamel rods with bridges of enamel.

vertical straight rows of prisms or rods are more indicative of Pattern 2; the enamel bridges in Figure 23 suggest a Pattern 3 structure (Boyde, 1965).

Summary

Neither the mass matrix nor the tooth or bone has any preserved phosphate that could be detected. However, the femur, which is only 45 meters away, does have recognizable amounts. It is reasonable to believe that if this small mammal bone was independently fossilized outside of its present matrix, near the other *T.rex* bones, which contain phosphate, that the mammalian bone would contain phosphate too. The fact that no phosphate is found in the mammalian remains suggests that this matrix is not a fecal mass but was fossilized internally and was stomach contents. This being partially digested stomach contents, rather than discharge excrement, was the fortunate, highly rare variable that allowed the mammalian remains to be discovered.

It can be assumed that since the mandibular bone itself was not digested or dissolved, as happens within a few hours inside a crocodile, then the dinosaur died very quickly after its last meal. Further, its stomach's extremely acidic environment was diluted quite rapidly with a watery mud and sand mix. A flood of this sort, which could envelop a creature like a *T.rex* so completely, points to a watery cataclysm, which was most likely Noah's Flood (Genesis 7–8).

The mandible belonged to a small mammal, based on its enamel rods seen in the electron microscope images. The enamel rods decussate (twist) in many locations and are straight in others. There are enamel bridges in some and interrow interprismatic enamel in others. With these findings it is possible to assign, with some reservation, the mammal enamel microstructure to Pattern 2 in some areas and Pattern 3 in others (Boyde, 1965).

The electron microscope studies revealed a slower-than-modern-day development of the circadian (daily) mammalian dental enamel prisms. This may suggest a prolonged development in this mammal, which may impact lifespan.

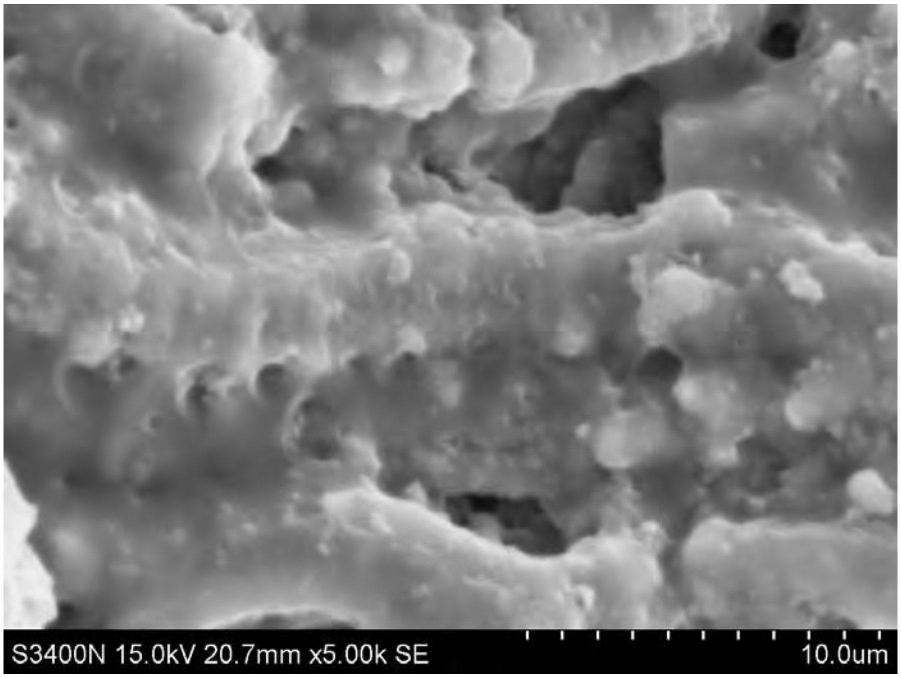


Figure 23. Bridges of interprismatic enamel between the rods. This is a close-up of Figure 22.

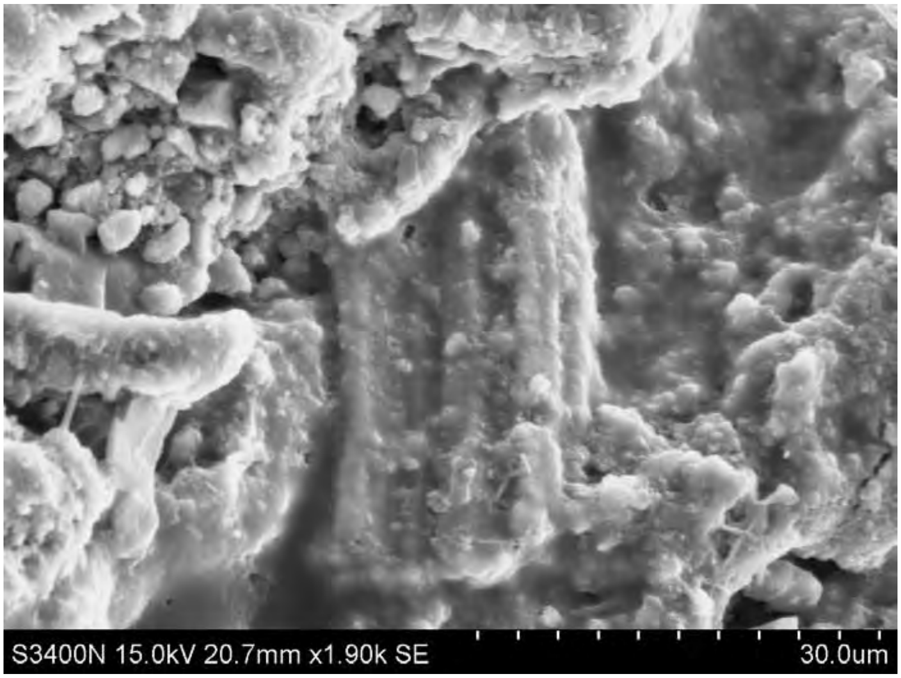


Figure 24. Straight bundles of rods.

Currently, this find is most accurately attributed to Mammalia, Incertae sedis.

Acknowledgments

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A Survey of Lightning

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Abstract

Lightning is a dramatic and poorly understood display of electrostatic energy. Present thinking is reviewed on its production and behavior. The multiple purposes of lightning give evidence of intelligent design, especially the transformation of atmospheric nitrogen to a usable form for plants, animals, and people. Varieties of lightning and their control with lightning rods are briefly described. Fulgurites, popularly called fossilized lightning, are suggested as possible evidence for a young earth.

Introduction

Every second there are hundreds of ongoing thunderstorms in process around the world that produce multiple lightning strokes. The impressive display of electrical energy is frightening when a lightning bolt strikes nearby. As is the case for all severe weather, one might ask how lightning fits into the design of creation. After all, lightning causes fires, destroys property, and may cause injury or death. The basic answer is that all harmful events have their origin in a once-perfect world that was contaminated by the Fall of mankind, also called the Curse, as described in Genesis 3. Before this event, at the beginning of Creation, the earth's hydrologic cycle was different from today, with a lack of precipitation according to Genesis 1:5–6. If this lack of rain existed until the Curse, and perhaps until the Noahic Flood 1500 years after Creation, then the early earth may not have experienced lightning.

Aside from the universal, fatal effects of sin, there remains abundant evidence that details of nature, including lightning, are established for our survival and well-being. This review article approaches the topic of lightning as an essential part of the present-day creation. Mark Twain once illustrated the power of small words by contrasting the lightning bug with lightning (e.g., Bainton, 1890, pp. 87–88). Likewise, all parts of creation, from the nanoscale to cosmic structures, declare the glory of the Creator of the universe.

The Source of Lightning

More than 250 years ago, Benjamin Franklin (1706–1790) investigated lightning by flying a kite during a spring storm. This story is not a mere urban legend but occurred in Philadelphia on a dark June day in 1752. Franklin noticed that small sparks jumped to his knuckles from a key tied to the kite string. Franklin survived this dangerous storm activity and correctly concluded that the lightning overhead was a similar electrical spark on a giant scale.

The voltage, current, and energy dissipation from lightning are much greater than the familiar "snap" we experience from static electricity when shuffling across a carpet during low-humidity conditions. A lightning stroke can involve many millions of volts, if not billions, with momentary peak current surpassing 36 kilo amperes (Pearce, 1997). The actual magnitude of moving electrical charges may exceed 20 coulombs, or 10^{20} electrons (Rigden, 1996). There is little agreement in the literature on the actual numbers involved due to the great variation in lightning behavior and the difficulty of quantitative measurements.

Static electricity occurs when frictional motion separates outer electrons from their host atoms. The mechanism of this charge separation is not well understood, since negatively charged electrons are strongly attracted to positive electron-deficient atoms, or ions. Nevertheless, electron migration away from parent atoms occurs on a grand

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scale. Simply walking across a carpet or brushing one's hair readily results in an accumulation of more than one trillion unbalanced electrons.

Within an active storm cloud, updrafts and downdrafts cause water droplets and ice crystals to move past each other with frictional effects. As a result of air turbulence, large concentrations of separated positive and negative electrical charges may occur within the cloud. When a sufficient attractive force builds up between regions of unlike charge, a surge of electrons may result. The swarm of negative electrons moves to a positive region of the same cloud, or to a nearby cloud mass, or directly to the ground, each path resulting in a visible lightning flash.

Electrical current always moves along the path of least resistance. In air this route depends on temperature, density, humidity, wind speed, and other factors, hence the zigzag appearance of lightning. The multiple variables controlling the lightning path result in chaotic motion that is beyond physics analysis and prediction. One is reminded of the Creator's challenge to the patriarch Job four thousand years ago: "Do you send the lightning bolts on their way? Do they report to you, 'Here we are'?" (Job 38:35 NIV).

In one popular description, cloud-to-ground lightning is initiated when an invisible avalanche of negative electrons first rushes to the ground. This is called the stepped leader stroke. This surge provides a channel for a much more energetic return stroke. Electrons "drain out" from the bottom of the channel, followed by successively higher positions. This return stroke causes the visible lightning flash. High-speed photography reveals dozens of back-and-forth lightning strokes occurring milliseconds apart and each lasting just microseconds (Rigden, 1996).

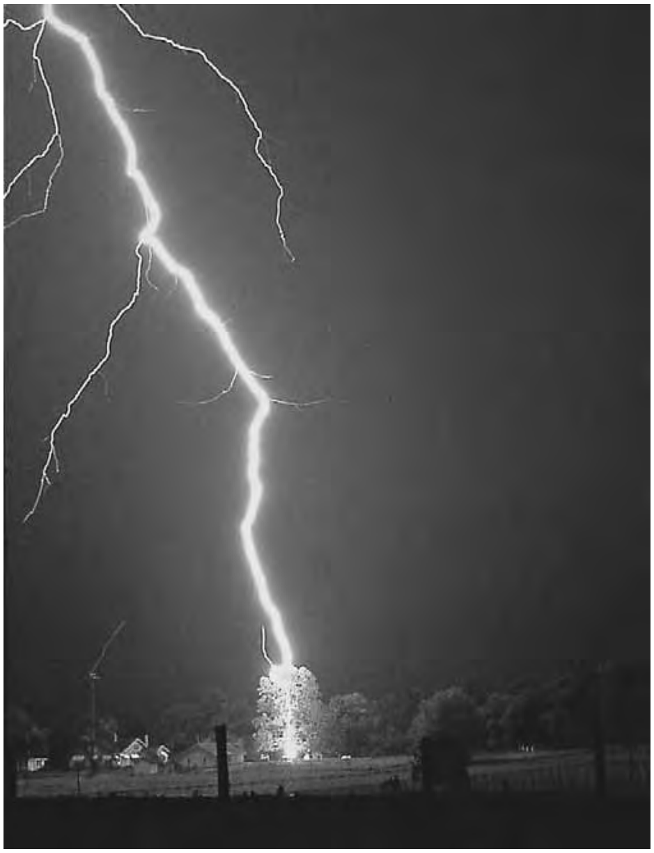

Figure 1. Common streak lightning terminates on a neighborhood tree. If not shattered, the tree will be scarred and weakened (Wikipedia Commons).

The actual path of charged particles through the air is just inches wide at most. However, the extremely high electrical energy causes an intense light flash that persists in our vision. Nearby air is rapidly heated to more than 50,000°F (approximately 30,000°C), five times hotter than the sun's surface. This instantaneous heat produces a shock wave of outward-moving air pressure, which we hear as thunder. A weak pulse of x-ray radiation has also been detected accompanying lightning (Dacey, 2010).

The charged particles in a lightning stroke travel at 30,000–60,000 miles per second, one-sixth to one-third the speed of light. The resulting flash of light then reaches our eyes almost instantaneously, traveling nearly a million times faster than the sound of the thunder. The "five-second rule" gives an approximate distance to the lightning source. Sound speed varies with air temperature and averages about 1100 feet per second (750 miles per hour), or about one mile in five seconds (one kilometer in three seconds). Thus if thunder is heard ten seconds after seeing the flash, the lightning occurred two miles away. The continuing rumble of thunder is due to portions of the lightning stroke located higher in the sky and more distant.

Recent Developments

Ongoing research efforts seek to further understand the mechanism of lightning, and two studies will be mentioned here. First, cosmic rays may be a trigger for lightning discharges. These rays are high-speed subatomic particles that probably arise from supernovae events in space (Jaggard, 2013). As the cosmic rays interact with gases in the earth's upper atmosphere, there are indications that they generate intense, transient electric fields that trigger the initial surge of electrons through the air in a lightning stroke (Klotz, 2009).

A second area of research concerns aircraft that may be hit by lightning or may themselves initiate a lightning stroke. This is seldom a problem because of the typical outer fuselage of aluminum. If struck, the electrical current is limited to the metallic skin without affecting the interior of the plane. The new generation of aircraft, however, includes nonmetallic composite materials. Metal fasteners such as rivets are part of the structure, and they provide an electrical passageway to the plane's interior with possible damage from a lightning strike. There is ongoing study to protect such aircraft, including embedded surface layers of conducting fibers and screens (Marks, 2013).

Types of Lightning

Varieties of lightning include the names ball, bead (chain), forked, sheet, ribbon, and streak lightning. There are also upper atmospheric forms of lightning called red sprites and blue jets. Figure 1 shows a bolt of streak lightning hitting a neighborhood tree. Such trees may burn or else disintegrate into flying shards of wood as the interior sap is converted instantly to steam. If the target tree manages to survive, it will be scarred and weakened. Oak trees are especially vulnerable to lightning strikes: "Beware of the oak; it draws the stroke." Oaks tend to be taller than the surrounding trees and have high moisture content, thus attracting lightning (DeYoung, 1992, p. 89).

Aside from weather events, static lightning discharges are sometimes associated with blizzards, sand and dust storms, smoke, and volcanoes. There also are indications of static electricity and lightning discharges on other planets, including Venus, Jupiter, Saturn, and Uranus.

On rare occasions lightning apparently may take the form of a beach-ball size sphere of glowing electrical charge or plasma. The sphere may last for several seconds or minutes. The reason a small cloud of electrons and positive ions arises and persists in the air is not understood. Figure 2 is a woodcut illustration of ball lightning that has descended through a chimney and is floating across a room. Several video clips of possible ball lightning events are available on the Youtube website.

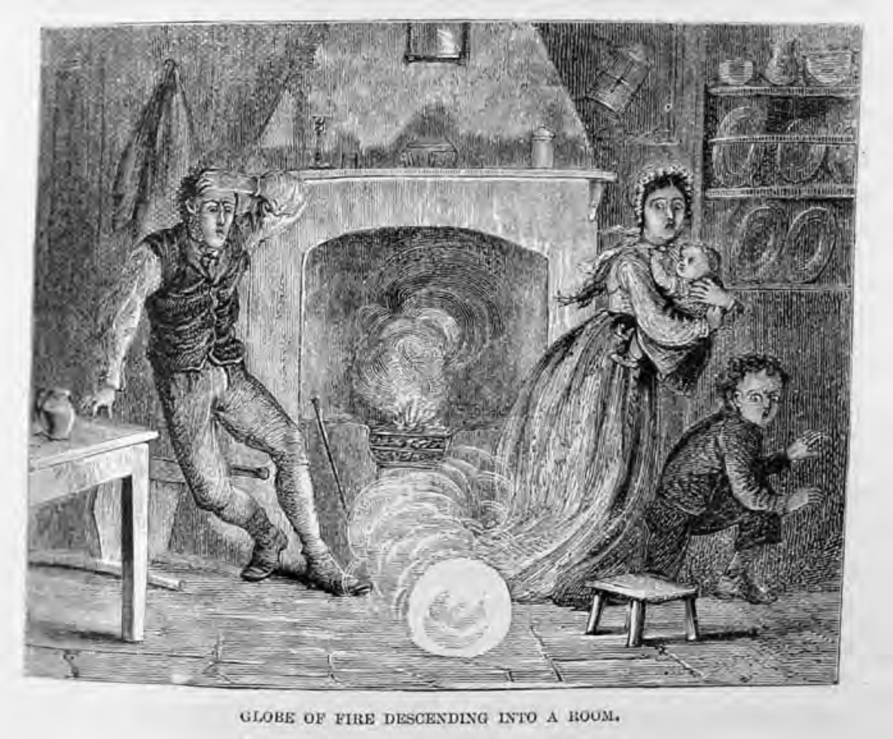
GLOBE OF FIRE DESCENDING INTO A ROOM.

Figure 2. A London woodcut from 1886 showing ball lightning inside a home. The caption reads, "Globe of fire descending into a room" (Wikipedia Commons).

Friends tell me of an unusual lightning event occurring during the 1950s. The couple sat in their living room during a summer evening thunderstorm in Winona Lake, Indiana. Following a bright lightning flash, a glowing ball about one foot in diameter slowly floated through the window screen and directly into their living room. The ball bounced once on the carpet, then drifted over to a wall and disappeared into an electrical outlet. All that remained was a scorched spot on the carpet and a burning odor. The friends recalled being considerably shaken by this apparent close encounter with ball lightning.

Lightning Rods and St. Elmo's Fire

Objects on the ground can be strongly charged by induction due to charged clouds high above. When the cloud base is negative, for example, earth objects become positive as their mobile electrons are repelled by the cloud and move downward into the ground. Sufficient charge accumulation may cause an electrical discharge into the surrounding air. The result may be a visible glow or coronal discharge around items on the ground, especially near pointed objects where electric charge tends to accumulate. The glow has been observed at night around church steeples, towers, lightning rods, aircraft, tree leaves, and the ice axes of mountain climbers. The following paragraph describes the eerie glow of static electricity on the horns of western steers.

Writer Frank Dobie (1888–1964) had a lifelong familiarity with Texas Longhorn cattle and describes their interaction with a lightning storm during a cattle drive.

> Ball lightning rolled along the ground and all about us … Finally the lightning settled down on us like a fog. The air smelled of burning sulfur … The electricity played along the horn curves as if they were lightning rods, at the same time darting around and illuminating spurs and bridle bits. Balls of foxfire ran around the wet brim of a cowboy's hat. Snakes of fire sometimes ran over the backs of the cattle and along the manes of the horses (Dobie, 1941, p. 96).

The term "foxfire" in this quote is a rare, mysterious night glow observed near the ground. It may be due to burning methane gas, bioluminescent fungi, and in the case of cattle, static electricity.

Lightning rods were invented by Benjamin Franklin. He wrote in his *Poor Richard's Almanac* in 1753, "It has pleased God in his goodness to Mankind, at length [to reveal] to them the means of securing their habitations and other buildings from mischief by thunder and lightning" (Krider, 2006). Lightning rods give protection in two ways. First, charge accumulating on a structure is dissipated from the sharp points of lightning rods as the charge moves into the surrounding air. If a building nevertheless becomes the target of a lightning strike, the surge of electric current is diverted downward into the ground by the lightning rod through an attached thick metal cable. Once a lightning strike occurs, static charge buildup can begin again immediately. For example, New York City's Empire State Building is struck more than twenty times annually. In these cases there is little or no harm because the structure is well grounded with lightning rods.

An older name for a visible coronal discharge is St. Elmo's fire, after Saint Erasmus of Formiae, an Italian bishop from the fourth century who was also called Saint Elmo. He was known as a protector of sailors on the Mediterranean Sea. The St. Elmo glow was observed around the masts of sailing ships during intense storms. The mysterious light also became associated with Castor and Pollux, twin Greek deities. Acts 28:11 records that the apostle Paul sailed to Rome aboard a ship with the figurehead of the gods Castor and Pollux. These names also are associated with two bright stars in the Gemini Twin constellation.

Lightning Mythology

The dramatic display of lightning has led to many historical traditions, including its cause being the visible anger of gods. The Greeks made shrines of locations that had been struck by lightning and consecrated them to Zeus. Ancient Greeks also believed that lightning strikes hitting the sea resulted in the formation of pearls. Some other cultures thought that mushrooms grew where lightning hit the ground (Lyons, 1997, p. 145).

Centuries ago, officials in Brescia (Brecia), Italy, declared that church buildings were safe from being struck by lightning. They reasoned that God would not damage places of worship. As further insurance, the church bells were rung during storms to ward off lightning, a dangerous activity for bell ringers. Some churches were used to store arsenals, including gunpowder. In 1769, a church tower in Brescia was struck and set afire. The resulting explosion of many tons of gunpowder destroyed part of the city and killed 3,000 people. One must conclude that lightning is no respecter of church buildings.

Fulgurites

When lightning strikes sandy soil, the intense heat may melt the silica sand and form hollow glass tubes, typically an inch or less in diameter. The fused glass is sometimes called petrified lightning, and the tubes are called fulgurites, from the Latin word *fulgur,* for thunderbolt. The fulgurite tube shapes are breakable like glass, but the resulting shards are stable. In some cases, fulgurite tubes have been excavated to a depth of 15 meters (49 feet).

I have a palm-size fulgurite that was embedded in the soil at the base of a telephone pole in Maine (Figure 3). Lightning earlier had struck and burned the pole as current moved downward into the ground. Hollow knobs on the pictured fulgurite show that the surge of electricity branched off in at least seven directions upon entering the ground. The bottom portion of the sample has a smooth, glassy appearance where molten sand pooled. The fulgurite sample somewhat resembles coral or the volcanic rock called scoria.

Consider an order-of-magnitude estimate for the number of fulgurites predicted by evolutionary deep time. With approximately one hundred lightning strokes per second occurring across the earth, throughout the alleged 4.6 billion years of earth history, at the current lightning rate, totals 1.45×10^{19} strikes. Further, suppose that one-fourth of these lightning strikes hit dry land and that just 1% of these land strikes resulted in fulgurite formation. This is a generous assumption since the large majority of lightning strikes hit land rather than water (Lyons, 1997, p. 147). Considering 1.28×10^{14} total square meters of dry land across the earth, there then should be accumulated more than 1,000 fulgurites per square meter of land everywhere (1.45×10^{17} fulgurites/$1.28 \times 10^{14} m^2$). This quick calculation assumes a constant historical rate of lightning occurrence. If this estimate is valid, the question then arises, why are fulgurites a rare find? Given the long age timescale, should not fields everywhere be choked with the glassy shard remnants of historic fulgurites? Even if the estimate of predicted fulgurites is reduced by a thousand or more, the problem of fulgurite absence remains. Perhaps there is a fundamental problem with the evolutionary timescale.

Similar arguments have been made and critiqued for the lack of meteor-

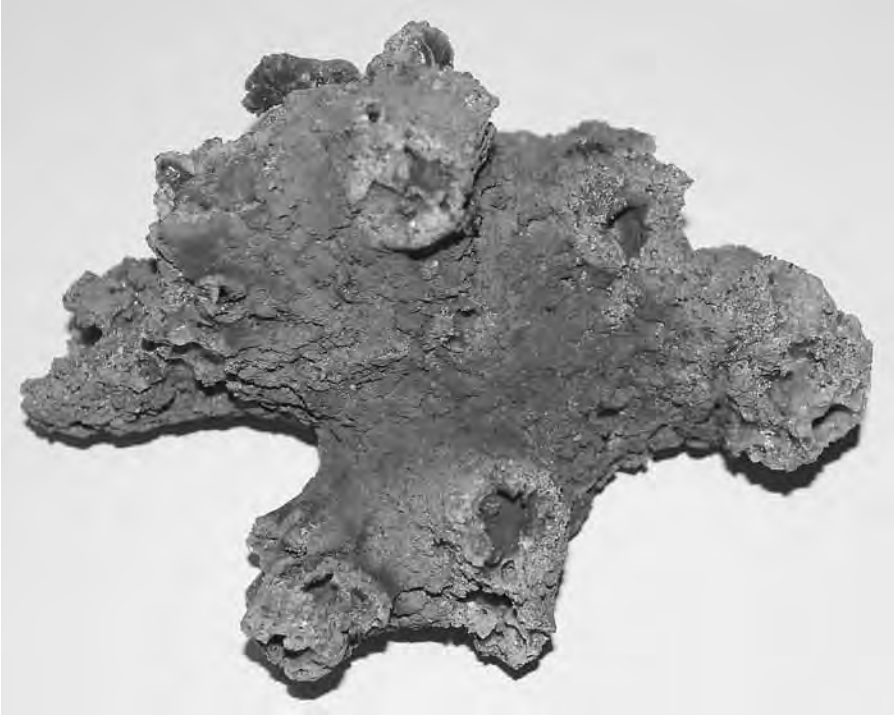

Figure 3. A fulgurite results from lightning striking the ground and fusing the sandy soil. This glassy sample is six inches (15cm) across

ites or their nickel residue in earth's sedimentary rock layers (Whitney, 1941; Stevenson, 1975; Young, 1988). There are many related challenges to the unfathomable assumption of 4,600,000,000 years of earth history, as well as the current assumption of the universe being three times older yet, at 13.8 billion years.

Purpose

Lightning and Nitrogen Fixation

The earth's atmosphere consists of 78% nitrogen (N_2), 21% oxygen (O_2), and smaller amounts of argon (Ar), carbon dioxide (CO_2) and other gases. The element nitrogen is the third most abundant element in the human body and must be renewed continually. However, our bodies cannot directly utilize nitrogen in its gaseous form because the nitrogen atoms are joined together by a very strong triple covalent bond. The nitrogen must first be incorporated into plants as part of the food chain.

Certain plants, called legumes, have nitrogen-fixing bacteria called *Rhyzobia* in their root nodules. Examples include alfalfa, beans, clover, peanuts, and peas. If the early earth did not experience lightning, as suggested earlier, then legumes could have supplied the soil with nitrogen.

The second major way by which nitrogen is transformed naturally into a useable form is by lightning. Molecules of nitrogen are broken apart by electrical energy:

$$N_2 + O_2 + \text{energy} \rightarrow 2NO$$

The resulting nitrous oxide then combines with oxygen in the air:

$$2NO + O_2 \rightarrow 2NO_2$$

The nitrogen dioxide readily dissolves in water:

$$2NO_2 + H_2O \rightarrow HNO_3 + HNO_2$$

These two products in the diluted form of nitric and nitrous acids provide essential nitrogen for plants.

There is wide variation in estimates of the worldwide amount of nitrogen compounds produced annually by lightning. Values range from 5 to 44 million tons per year (Pearce, 1997; Postgate, 2002). Whatever the case, lightning adds an impressive amount of useful nitrogen to the soil globally.

The nitrogen-fixing property of lighting may possibly be referenced in Psalm 135:7: "He [the Lord] maketh lightnings for the rain" (KJV). When nitrogen gas molecules are broken down by lightning, it is rainwater that carries nitrogen to the plants, in apparent agreement with the verse. However, the Hebrew text also allows the adjective *with* in place of *and*: "He sends lightning with the rain" (NIV). Therefore the Psalm 135:7 reference is not a strong argument for an anticipation of our modern understanding of nitrogen fixation; however, the verse is compatible with the idea.

Other Purposes

Beyond wide-scale nitrogen fertilization, lightning provides further benefits to the earth. Fires are frequently ignited by lightning in remote forests and grasslands. These fires play a positive part in maintaining the health of wilderness areas by limiting the overaccumulation of hazardous ground fuels. Burned areas recover rapidly. For example, aspens are a pioneer tree species that grows rapidly in burned areas. Also, some pinecones need the heat from fire to melt their interior resin and release seeds. In our day, forest-fire control is controversial, as communities develop in wilderness areas. A federal government statement on fire control reads, "Though wild land fires play an integral role in many forest and rangeland ecosystems, decades of efforts directed at extinguishing every fire that burned on public lands have disrupted the natural fire regimes that once existed (National Fire Plan, 2013).

Ozone gas, O_3, is an unhealthy pollutant at ground level. However, in the lower stratosphere, 10–20 miles high, the earth's ozone layer provides protection from solar ultraviolet radiation (UV). This high-energy form of light causes skin and eye disease and is harmful to plant leaves. The UV is absorbed and prevented from reaching the ground by chemical interactions with the ozone. Studies show that substantial high-altitude ozone is made by lightning, as much as 30% of the total ozone layer (Zhang et al., 2003). Lightning may serve further beneficial purposes yet unknown.

Conclusion

We have surveyed the physical properties of lightning and its impact across the earth. The extreme electrical energy of lightning ignites fires, while it also converts atmospheric nitrogen to an essential, useable form for plants, animals, and people.

There is an attitude of fear by many regarding lightning, and for good reason with its intense flash, high energy, and accompanying thunder. However, there is good counsel in Psalm 29, which describes a Middle Eastern storm as it sweeps in from the Mediterranean Sea. Cedar trees are broken by the wind, and oaks are twisted. Thunder and lightning shake the desert floor. And what is the response of the people who know their Creator? They all shout, "Glory!"

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Massive Mountain Planation of the Eastern Canadian Seaboard

Ian Juby*

Abstract

Large planation surfaces have been documented around the world. Secular geologists are hard pressed to explain them, while diluvial explanations appear reasonable. Such a large-scale planation surface is documented on the Canadian seaboard. It appears to be a dissected planation surface covering over 800 km in Nova Scotia, Newfoundland, and Labrador. Of the possible explanations for its origin, only one appears to fit the facts of the field: a large, fast-flowing sheet of water eroding the rocks of the area. It has yet to be determined if erosion happened at today's elevations or whether there has been subsequent uplift. It is possible that many identified unconformities are simply planation surfaces distorted during uplift.

Introduction

Planation surfaces up to regional scale have been documented by both secular and diluvial geologists. These features are interesting because of their size, the uniformity of erosion across varying lithologies, and their present elevation. Together, these features present a profound puzzle for conventional geology, because the most likely explanation for their origin is the action of large-scale, fast-flowing sheets of water, flowing at high elevations in many cases.

I have examined a number of these surfaces, including the Cypress Hills in Alberta/Saskatchewan, the Hand Hills in Alberta, Joggins in Nova Scotia, and other minor surfaces along the Eastern Seaboard. However, none of these match the regional extent of another surface on the east coast of Canada. While it is possible that the planation surface at Joggins, Nova Scotia, is part of this surface, I will treat it as a separate entity, separated by the Cobequid Highlands to the east of Joggins. However, this East Coast planation surface is still a massive feature. Having been unable to find a name for this planation surface in the existing literature, I will tentatively call it the Newfoundland Planation Surface (NPS), named after the island on which the surface is most prominent.

Figure 1 shows waypoints where position and/or elevation was marked using GPS or documented as an outcrop of the planation surface. The southern terminus of the NPS is in Nova Scotia, in Guysborough and Antigonish counties ("X" in Figure 1). Although the planation surface itself is clearly present, its boundary is not entirely clear because of breaks, undulations, and further erosion to the west and south. The elevation in this area is around 160 m (all elevations given relative to mean sea level), but the surface gains elevation to the east and north, where it reaches approximately 400 m at the northern tip of the Cape Breton Highlands (Figures 2 and 3; points 3 and 4 in Figure 1).

North of the Cape Breton Highlands lies the Cabot Strait, and the NPS is again visible north of that water body in Newfoundland. Here it reaches an elevation of around 550 m (Figure 4; Figure 1, point 5). The NPS continues to rise, peaking at 814 m at "The Cabox" mountain, west of Corner Brook, Newfoundland (Figure 1, point 6). The NPS then begins descending north and west into Labrador. The surface is especially

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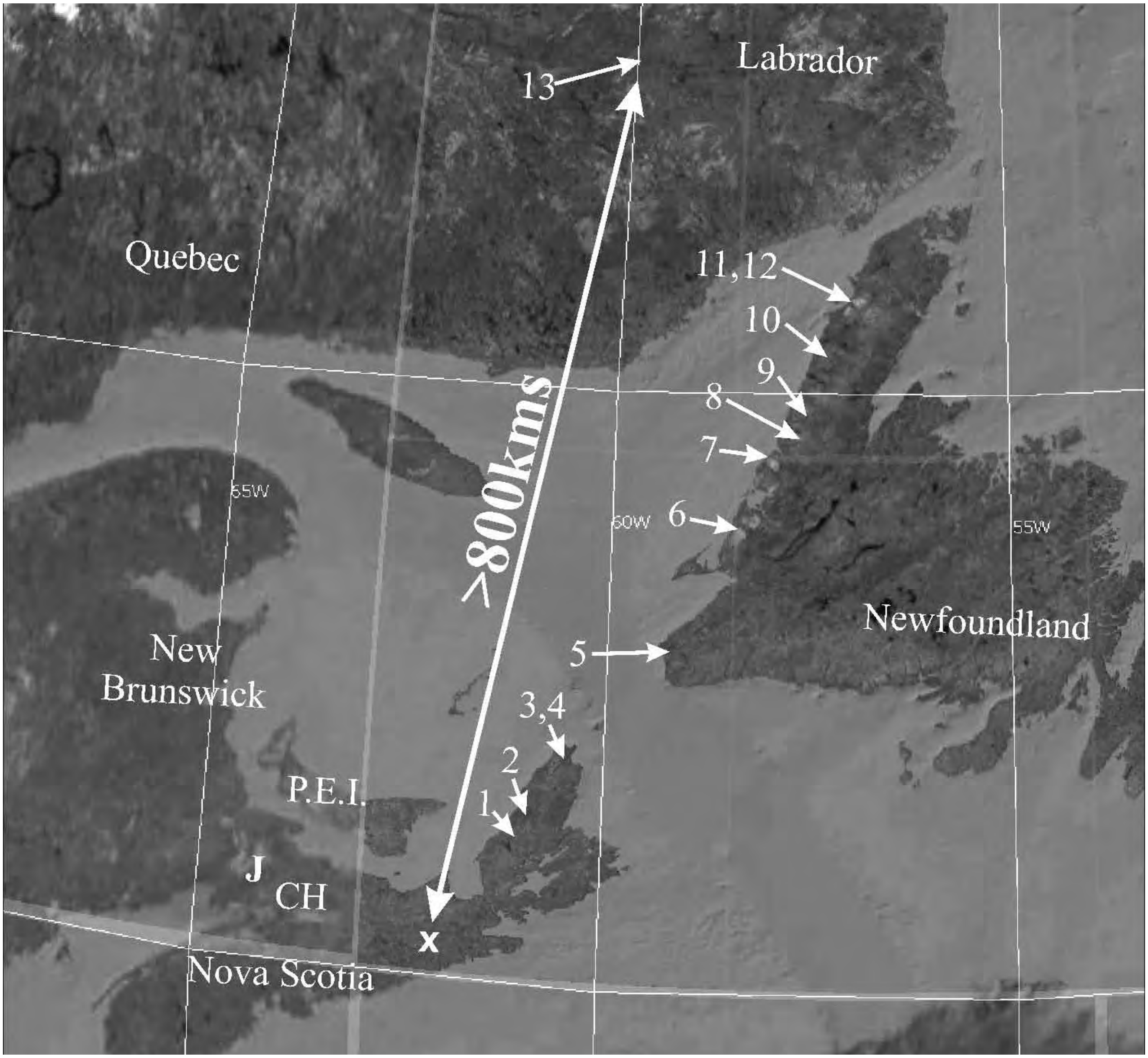

Figure 1. Map of significant points of interest along the Newfoundland Planation Surface.

prominent in Gros Morne National Park, where the mountains have all been planed flat as far as the eye can see (Figure 5; Figure 1, point 7).

The NPS has been eroded at the northern tip of the Northern Peninsula, with the last outcrop near the town of Castor River, at 600 m (Figure 6; Figure 1, point 12). Across the Strait of Belle Isle, the NPS is again visible inland, around the 500 m mark (Figure 7; Figure 1, point 13). The NPS apparently has been scoured away near the Strait of Belle Isle and been broken up by heavy erosion and uplifting to the north of point 13 in Figure 1. This would appear to be the end of the NPS.

Going by road, following the NPS takes a drive in excess of 1,200 km, although the distance is only about 800 km as the crow flies. Later erosion has obscured the exact boundaries of the NPS, and it is difficult to pinpoint specific starting and stopping locations.

Because the NPS covers such a wide swath, the geology of the mountains cut by the NPS is wildly varied and fascinating. They range from Carboniferous sedimentary rocks and basement gneiss in Nova Scotia (Figure 1, points 1–4) to

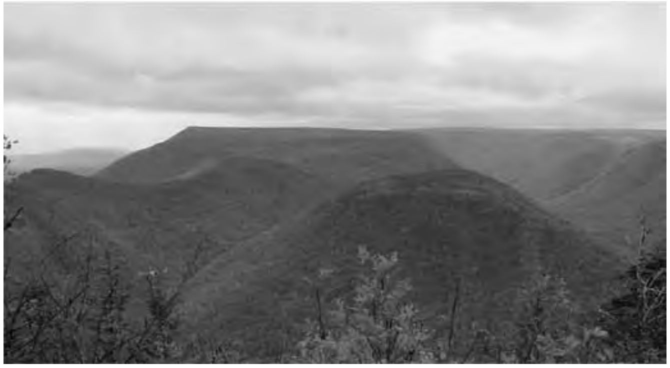

Figure 2. Planation surface at Cape Breton Highlands, taken from Sugarloaf Mountain, looking south.

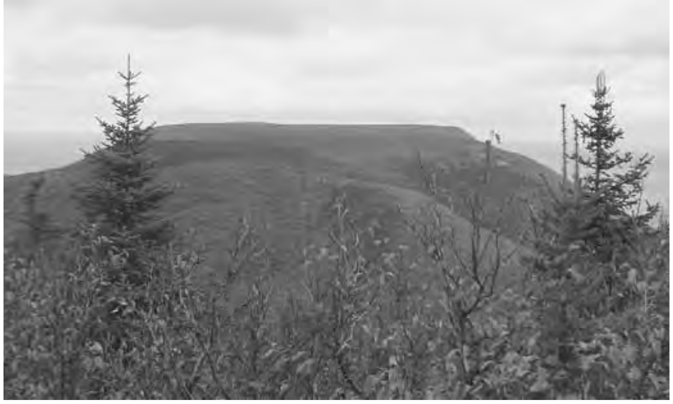

Figure 3. Planation surface at Cape Breton Highlands, taken from Sugarloaf Mountain, looking north toward Newfoundland across the Cabot Strait.

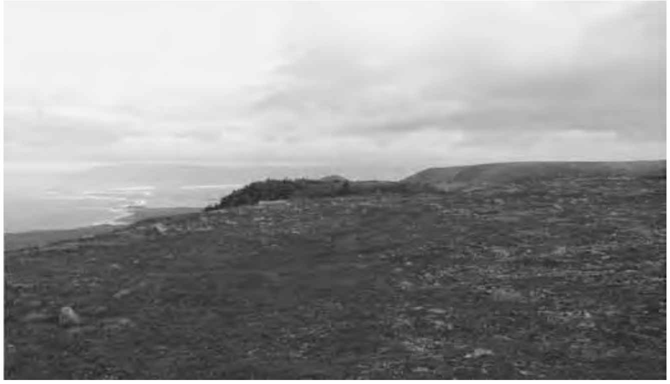

Figure 4. View from atop Table Mountain, near Port Aux Basques, Newfoundland, looking north toward the other planed mountaintops.

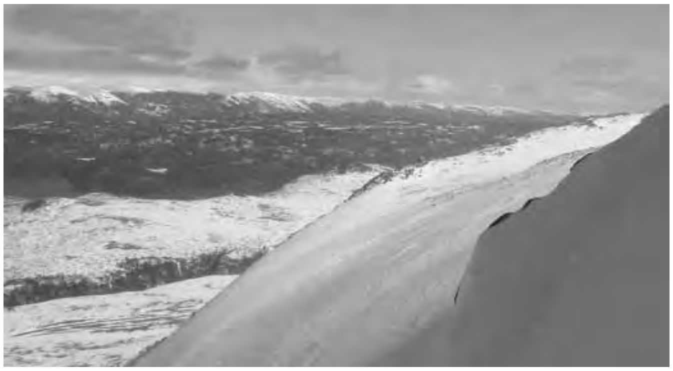

Figure 5. Looking southeast from about 50 m below the planation surface on the Tablelands. This was as high as I could climb due to snow and ice.

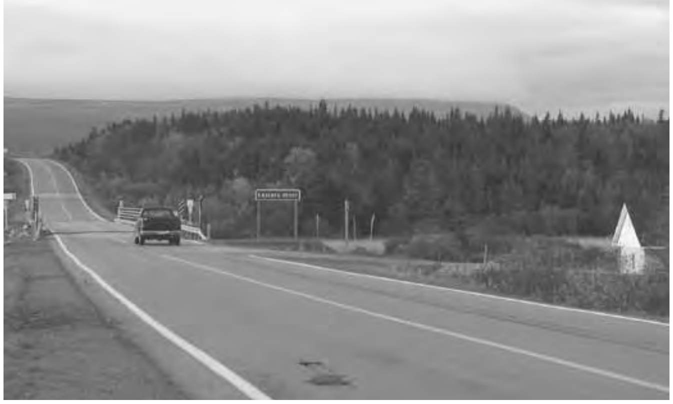

Figure 6. Last view of the planation surface at the northern tip of the Northern Peninsula.

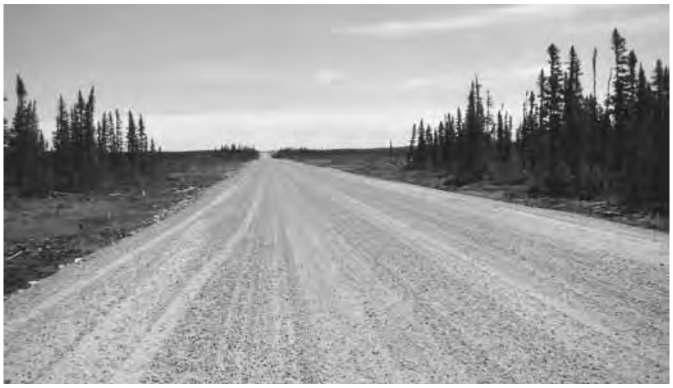

Figure 7. The new Trans-Labrador highway crosses over the top of the planation surface.

the granite, gneiss, and quartzite of Gros Morne Mountain (Figure 1, point 8) to the unique peridotite of the Tablelands Mountain (Figure 1, point 7). The rocks then transition to various sedimentary formations in the Northern Peninsula, southern Quebec, and Labrador before returning to basement gneiss throughout Labrador. The Cape Breton highlands are capped with dense trees, scrub brush, and bogs, which make it very difficult to traverse (Figure 8). The NPS in southern Newfoundland is quite similar to the Cape Breton Highlands and is capped with less dense scrub brush and bogs (Figure 9) and what appears to be felsenmeer—fields of rock broken by freeze-thaw cycles. In Gros Morne National Park, the Tablelands Mountain is barren of plant life and capped with *in situ* felsenmeer (Figure 10). These rocks appear to have formed in place; in numerous field excursions, I have found only one rock that was even possibly an exotic. Gros Morne Mountain is also denuded and covered with *in situ* felsenmeer (Figure 11). The hiking trail crosses over the top of the mountain from the southwest to the northeast, and as the mountain geology transitions from quartzite to gneiss, so does the felsenmeer. Clearly the breakup of the surface rocks was *in situ*.

The sedimentary rocks of the Northern Peninsula and southeastern Quebec/southern Labrador are predominantly horizontal and lay parallel to the planation surface (Figure 12).

My primary point is that whatever cut, the planation surface was not influenced by rock hardness. From very soft sedimentary rocks to extremely hard quartzites, the mountaintops were planed equally flat.

Formation of Planation Surfaces

Oard and Klevberg have discussed the formation of planation surfaces (Klevberg and Oard, 1998; Oard and Klevberg,

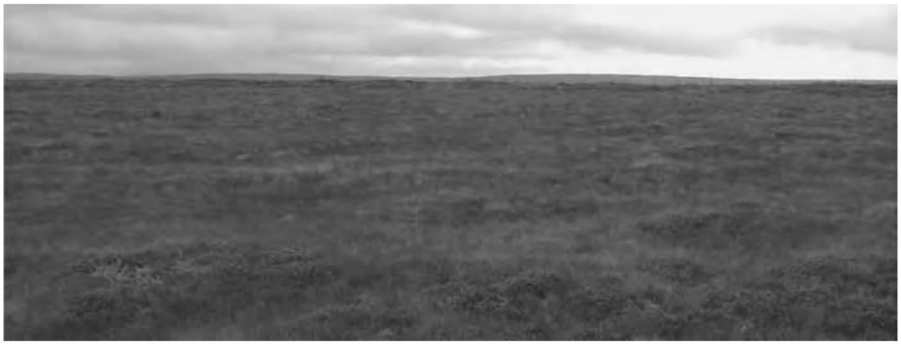

Figure 8. On top of the planation surface on the Cape Breton Highlands. This particular spot affords a good view; most of the surface is covered with dense scrub brush and deep bogs, making for extremely difficult hiking.

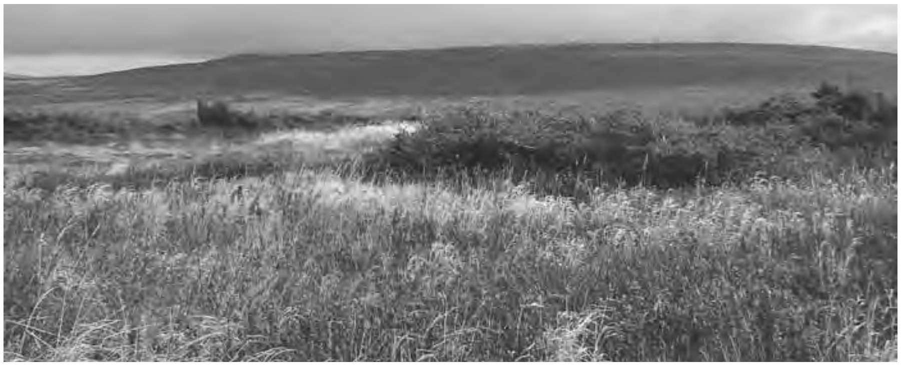

Figure 9. On top of Table Mountain, near Port Aux Basques. The planation surface here is also covered in scrub brush and bog, with some occasional felsenmeer exposed through the bogs.

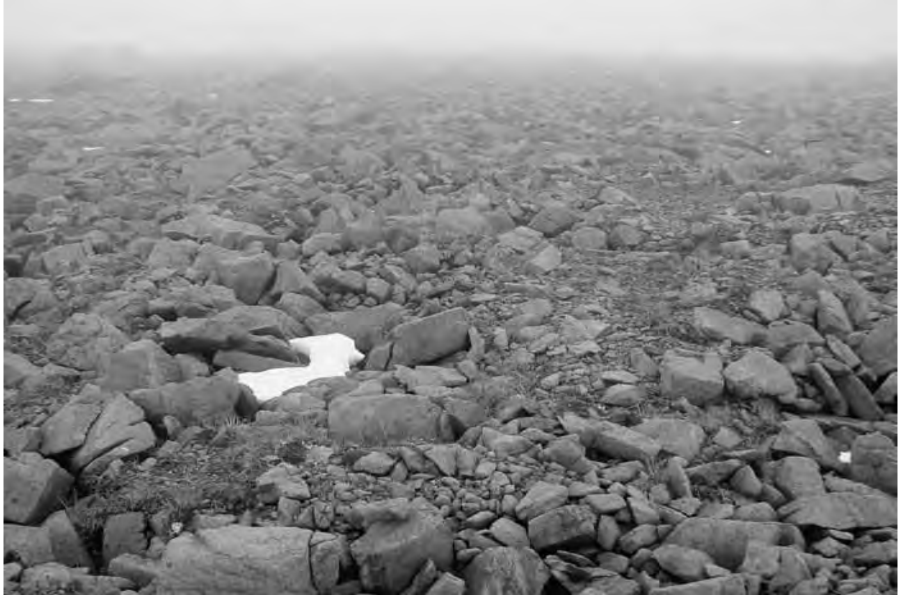

Figure 10. On top of Tablelands Mountain, Gros Morne National Park. The mountain here is composed of peridotite and capped with *in situ* felsenmeer.

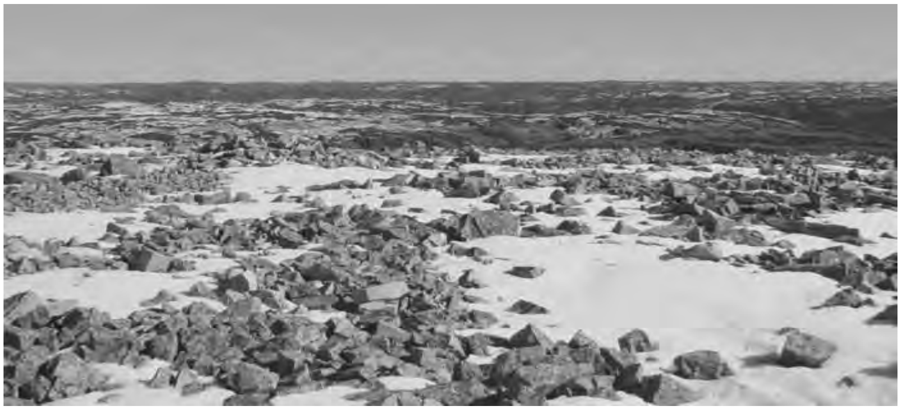

Figure 11. On top of Gros Morne Mountain, looking west. The mountains are all planed flat as far as the eye can see. The mountains here are capped with *in situ* felsenmeer.

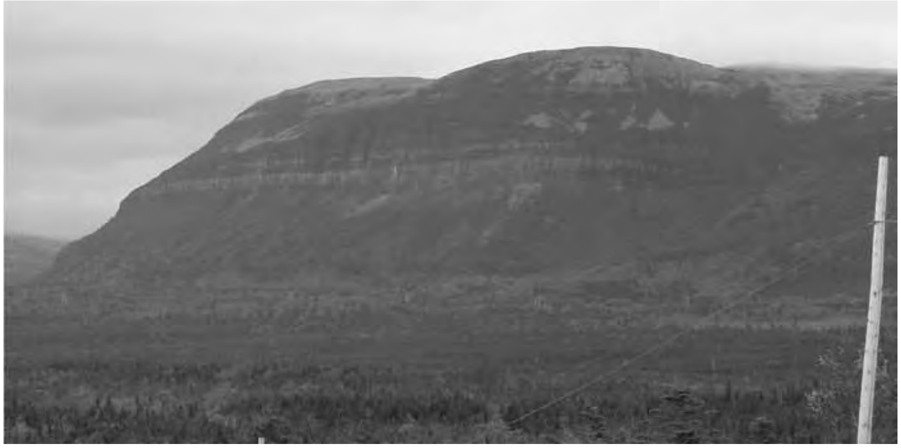

Figure 12. Horizontal sedimentary formations at the northern tip of the Northern Peninsula. The planation surface can be difficult to see when one is standing below the planation surface.

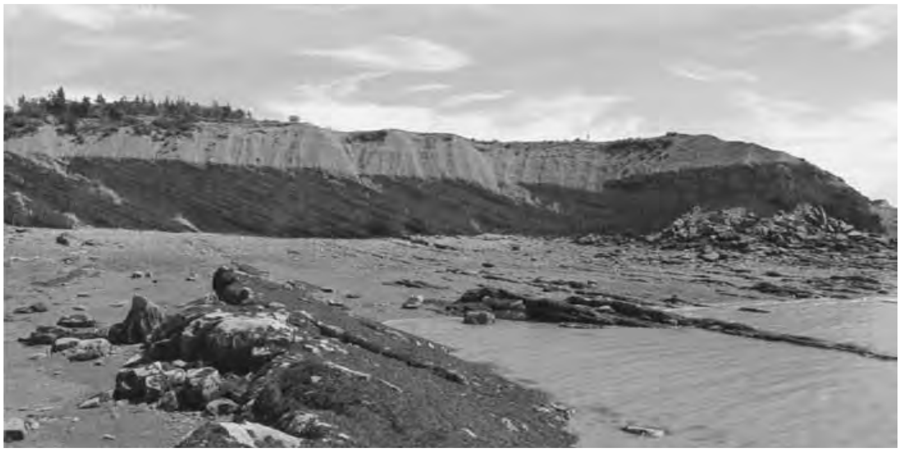

Figure 13. The cliffs of Joggins, Nova Scotia. Differential erosion caused by the tides stands in stark contrast to the planation of the very same layers at the top of the cliff.

1998; Oard et al., 2005; Oard 2000, 2008, 2011b), and have built a compelling case for planation surfaces being cut by fast-moving water. Their findings are supported by my observations at the Joggins Fossil Cliffs. Figure 13 shows the "reefs" in the Bay of Fundy, which are being eroded by the significant tidal action of the bay. The southward twenty-degree dip of the local strata can be seen in the cliffs. In the water, the softer rocks are eroded first. The harder rocks resist erosion and form the "reefs" jutting out of the water. However, the planation acted in a different manner. At the top of the cliffs, the exact same rocks have been sheared and are now flat and level, regardless of the hardness of the eroded rock. This is in stark contrast to the observable, present-day erosion process, which has produced the expected textbook example of differential erosion. Clearly these processes are *not* what cut the planation surface at the top of the cliffs. There are only three possible planing (*peneplain* is an outdated term, referring to Davis's outdated cycle of erosion theory) processes that could do so: glacial action, fast-flowing water carrying abundant sediments and rocks that acted as cutting agents, or a high-velocity sheet flow of water flowing well above cavitation thresholds.

Glaciers, by definition, flow downhill. Essentially, there is no "downhill" on the NPS. The steepest slope is from Gros Morne Mountain to the Topsails (isolated, sharp mountain peaks inland that preserve remnants of the NPS on their planed tops) 104 km to the east, having a downslope of 0.15 degrees. Such shallow slopes would greatly restrict the action of glaciers. However, glaciers carve gouges (not flat surfaces) and leave behind telltale features such as moraines. None of these typical glacial remnants has been observed in association with the NPS. Such moraines would be huge if there were any.

Mike Oard (personal communication, November 2012) suggested that the most likely explanation for the NPS was a slurry of sediment and rock carried in a large current, cutting into the rock. That mechanism is supported in other study areas such as the Cypress Hills, which are capped by cobble-to-boulder-size exotic rocks from hundreds of kms to the southwest. However, with the exception of the Cape Breton Highlands and the most southerly mountaintops in Newfoundland, which were covered in bogs and scrub brush, none of the mountains cut by the NPS exhibit these types of exotic rocks, and all of the observed broken rock capping the planation surface is felsenmeer. Observations of hundreds of square km of the NPS (which included a low-level flight over the NPS covering over 1,600 square km in Gros Morne National Park alone, and multiple ascents to multiple mountaintops) showed *no* exotics of any kind—no rounded rocks, no gravels, not even sand. It all appeared to be in-situ felsenmeer.

This indicates that the most viable explanation for the origin of the NPS was a large sheet flow, moving at velocities exceeding the cavitation threshold, if the water depth was shallow enough. However, the velocity was sufficient to shear the rocks, even if the water depth was too deep for cavitation to occur. (The current would have to be shallow for cavitation and was likely fairly deep, but no matter, just the shear velocity of the current is enough to flatten the terrain without cavitation.) This explanation is also compatible with the receding Floodwaters of the Noachian deluge.

At present, there are too many unknowns to actually calculate the flow parameters of velocity, water depth, and duration of the flow. It seems clear that cavitation was involved in shearing the various lithologies, and that provides a basis for estimation, depending on the depth. Oard (2011a) and Klevberg and Oard (1998) used clast size and slope to estimate velocity in the western United States. Holroyd (1990a) discussed problems with determining paleoflow conditions, and Barnhart (2011, 2012) derived flow parameters from bedforms and sediment size, based on similar work by Lalomov (2007).

Holroyd (1990b) suggested minimum speeds of 30 m/s as a threshold for substantial cavitational erosion. Klevberg and Oard (1998) and Oard, et al. (2005) derived velocities of around 30 m/s, or 110 km/hr, based on percussion marks and rounding in quartzite boulders. Having seen rounded quartzite boulders with percussion marks in British Columbia and Alberta that are larger than those used in the Oard and Klevberg calculations, and since their study derived minimum estimates of current velocity, it is likely that their estimates actually underestimate current velocity.

Oard and Klevberg (1998) attributed flow to the recession of Floodwaters off the continents. However, Baumgardner and Barnette (1994) made a profound serendipitous discovery while trying to build a computer model of the Tethys Sea during a worldwide flood. They found that the total submersion of the land produced continent-scale, high-speed vortices in response to the Coriolis effect. The patterns showed velocities on the order of 40–80m/s! The NPS is certainly far enough north to fall within the affected areas shown by their model. However, that would place the timing of the NPS earlier during the Flood, rather than at the end, as suggested by the absence of further large-scale geological work atop the NPS. But it is clear that either cause would produce velocities sufficiently large to generate massive sheet erosion.

Discussion

Observation of various planation surfaces leads to the question of their original elevation at the time of their formation. Were they cut at the elevations observed today or at a lower elevation, followed by subsequent uplift? Ollier and Pain (2000, p. 302, italics mine) made their opinions known, writing:

> The remarkable thing is that plains of great perfection are ever made, despite all the obvious possibilities of complication. But they are real, and planation surfaces were widespread *before the uplift* of the many mountains of Plio-Pleistocene age.

Their conclusion is understandable. The Beartooth Mountains of Montana and Wyoming exhibit a planation surface at elevations in excess of 3,000 m. Furthermore, there are multiple planation surfaces at different elevations in these mountains, indicating tectonic uplift between episodes of planation. But the NPS shows different features. If the NPS was cut at a lower elevation and then elevated by continental collision or vertical tectonics, then the resulting model would have to explain how the NPS remained both flat and level. This problem is multiplied by the size of the NPS; the absence of deformation would have been on a large scale, just as the scale of uplift would have been quite large. The significance of this particular planation surface is not just that it is incredibly flat, but also that it covers incredible distances.

This assumes that the NPS was originally one large surface, later dissected by gaps, like the Cabot and Belle Isle straits. If it was a single feature, then it extended more than 800 km from north to south and at least 120 km wide. Drawing a straight line between the start and end points of the NPS and measuring from that line to the Topsails measures about 350 km wide. While a large portion of the western part apparently was eroded away during the formation of the Gulf of St. Lawrence, it would seem reasonable to assume the NPS was originally 350 km wide or more. Could this large of an area have been uplifted without any evidence of deformation? The presence of mountains to the west of Gros Morne and to the north of the last outcrop of the NPS in Labrador suggests that uplift occurred, but that it was local and did not affect the NPS in a regional manner. Thus, the current elevation of the NPS is likely that at which it was cut.

Walker (1994) noted that the recession of the Floodwaters occurred in two stages: (1) a sheet-flow stage and (2) a channelized-flow stage. The successive episodes of distinct types of erosion are seen at the NPS, where the planation surface was cut by sheet flow and later dissected by channelized flow, forming the seaboard edges of the mountains and the associated deep canyons. Two geological/geographical models at the park visitors' center of Western Brook Pond show canyons with the suggested glacial action (Figure 14) and the present-day canyons (Figure 15).

Note the virtual absence of moraines. Significant amount of rock was removed in the carving of these canyons, which undoubtedly wound up in the ocean. But could glacial action cut canyons in that way? Western Brook Pond (the center canyon in the model of Figure 15) is one of several steep-walled box canyons cut into the mountains of Gros Morne National Park (Figure 16). Western Brook Canyon has very steep, 700-m-high walls. Another example is Ten Mile Pond Canyon (Figure 17), with walls in excess of 780 m and virtually nonexistent moraines at the canyon mouth. The small moraines cannot account for a fraction of the sediments removed during canyon formation. The lack of talus and large river delta suggests the canyons best match the erosion of a receding waterfall–like the Niagara Gorge. Yet there appears to have been no sufficient water source (no reservoir large enough to account for the volume of water that would have been needed) to feed such a waterfall to cut the canyon. However, the Flood scenario, with broad sheet flows being constricted to powerful channelized currents, would explain both the planation surface and the numerous canyons.

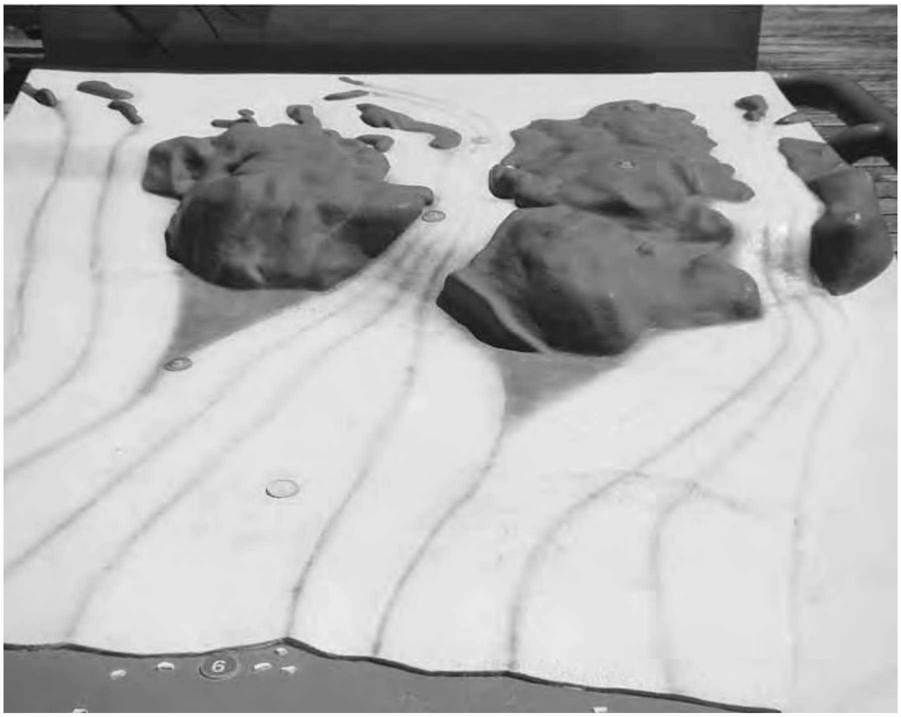

Figure 14. National Park model of the Western Brook Pond area with proposed glaciers. There is no doubt there were glaciers in the canyons, but did the glaciers cut the canyons? Notice that the glaciers are absent from the top of the planation surface.

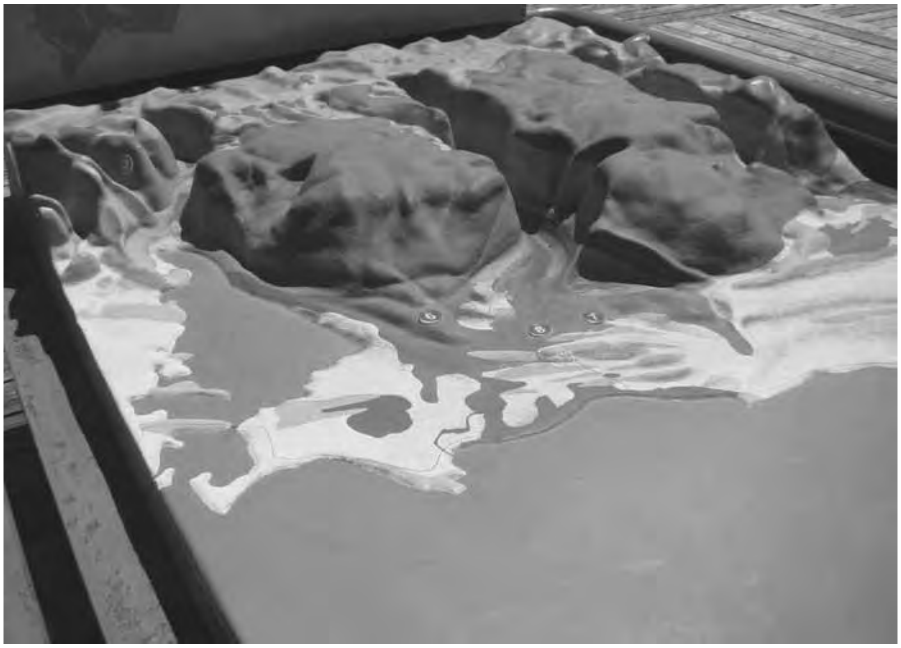

Figure 15. National Park model of the present-day Western Brook Pond area. Note the virtual absence of moraines and, even more importantly, the box-end that would best match the erosion of a waterfall cutting a canyon, rather than glaciers.

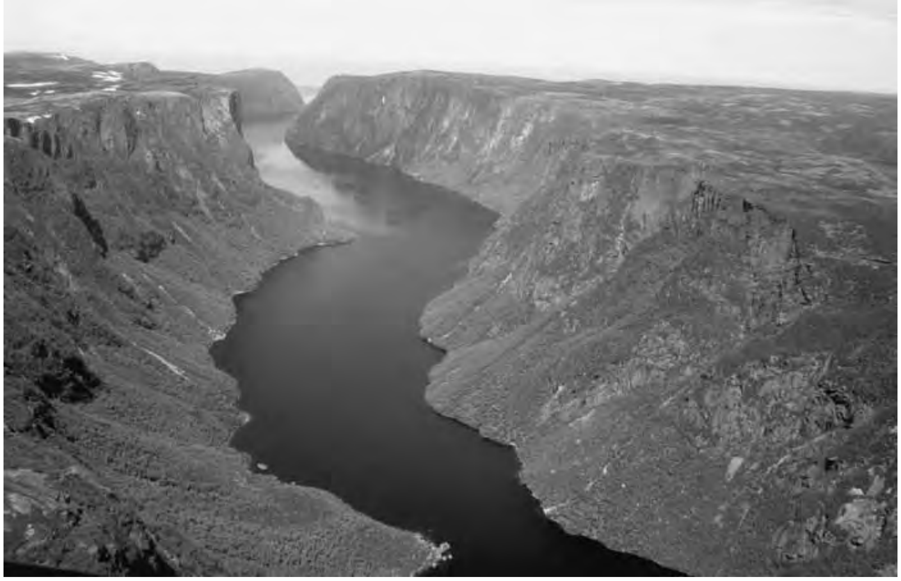

Figure 16. Western Brook Pond Canyon, looking down the canyon to the ocean, has extremely steep, 600-meter walls. It is highly unlikely that glacial action carved this and many other canyons in the mountain ranges here in Gros Morne National Park.

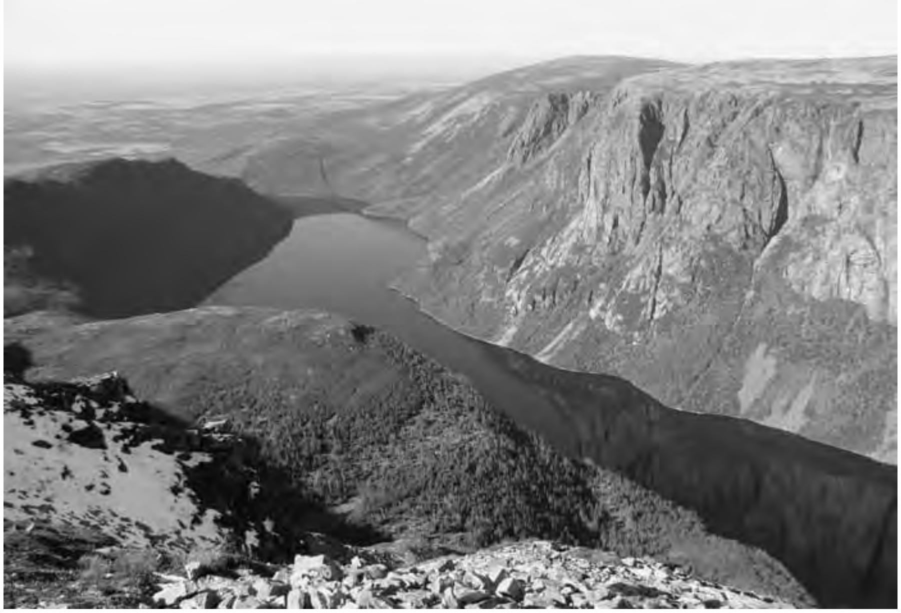

Figure 17. Ten Mile Pond Canyon, beside Gros Morne Mountain, is another example of some of the dramatic, steep-walled canyons that were cut into the planation surface. In this case, the walls are in excess of 700 meters high.

This model also argues against the possibility that the planation surface was cut at a lower elevation and later exhumed. The box canyons were cut to what is presently below sea level. If the planation surface was originally cut at sea level, then sea level must have later decreased by over 700 m to account for the canyon cutting. The Flood model also accounts for this problem, since base level was rapidly changing during the recession of the waters off North America.

There are also problems for this model. The canyons in Newfoundland face west, toward the straits—the opposite direction of the presumed receding Floodwaters. Furthermore, the straits between Newfoundland and the mainland are also products of erosion, but how does that episode fit in with the formation of the planation surface and the canyons?

The Tablelands Mountain in Gros Morne Park presents an especially interesting case. It is one of the more famous outcrops of peridotite in the world. Geologists travel from all over the world to study this outcrop, as they believe it to be a remnant of mantle forced up during plate collision. Since the Tablelands Mountain also was planed flat, the sequence would have to account for a plate collision prior to planation.

Also of interest are the mountains at Western Brook Pond. They are composed of basement gneiss dated at 1,250 Ma and resting on top of 400 Ma Devonian limestones. This implies significant thrusting at this location. Having had the privilege of examining seven "overthrusts" in North America now, and having found essentially no evidence for the alleged thrusting, I will remain skeptical about the Western Brook Pond thrust fault for the present. There may be other areas that do show such evidence, and judgment should be suspended pending further investigation. If this thrust is genuine, it implies an orogenic event that thrust the Canadian Shield basement gneiss over the Devonian limestone. All of this was followed by planation, again suggesting that the elevation of the planation surface has not significantly changed.

The planation surface at Joggins (Figure 1, "J") may be part of the NPS, but it has been separated from the rest of the surface by the uplifting of the Cobequid Highlands (Figure 1, "CH"). Many geologists believe that many unconformities are planation surfaces that were tilted, buckled, and distorted by later tectonic activity. Tilted layers visible in the Cobequid Pass also have been sheared, like a planation surface, but the cut surface is no longer flat and level. This may also be true of Prince Edward Island.

If the Cobequid Highlands are a distorted planation surface, it would seem to add credence to the idea that present flat and level planation surfaces were cut *in situ*, and that continued tectonic activity would distort planation surfaces instead of simply elevating them.

Likewise, the Joggins strata were also tilted prior to planation. The most likely cause of the tilting of these 5,486 vertical m of sedimentary layers was the East Coast orogeny. Thus the tilting, buckling, and elevation of the sedimentary layers occurred first, then the receding floodwaters eroded the planation surface. It is possible that the East Coast mountains were among those raised during the Flood, when the continents were elevated relative to the newly forming deep ocean basins.

Conclusion

The Newfoundland Planation Surface is a regional-scale planation surface that extends from Nova Scotia to Labrador. Its formation is difficult to explain by conventional geology but fits well within the late Flood recession, which included sheet flow followed by channelized flow on a massive scale. That flow most likely would have been from west to east, off North America, but more study is needed to provide details of the water's path, depth, and velocity. It would have been at least 800 km wide and flowing at a minimum of 30 m/s. Because the planation surface was probably cut near its present elevation, which reaches 800 m, the only reasonable explanation is the recession of the Flood.

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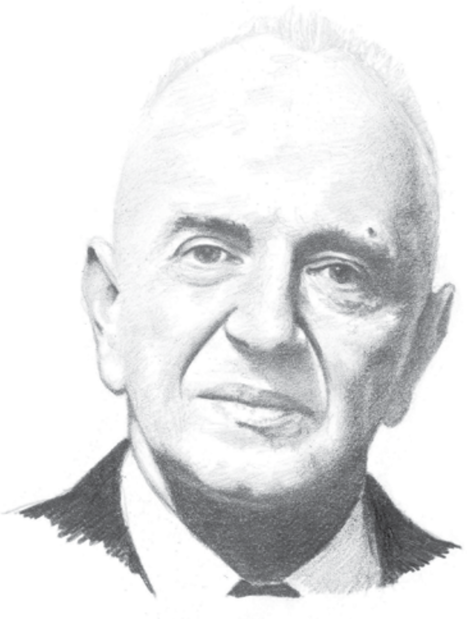
Dobzhansky: 40 Years Later Nothing Makes Sense

Bob Enyart*



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Abstract

Forty years ago Theodosius Dobzhansky, a scientist credited with developing the reigning paradigm of neo-Darwinism, published his iconic article with the famed title, "Nothing in Biology Makes Sense Except in the Light of Evolution." The intervening decades have seen his three predictions falsified; namely those regarding genetics and the tree of life, the role evolution theory would play in the progress of biological science, and one particular Arab sheik whom Dobzhansky identified by name. Dobzhanky's claims are evaluated in the light of four decades of hindsight, much additional scientific research, and the continued development of the creation model. His arguments regarding the diversity of life, biological universals, and abiogenesis are answered in a point-by-point presentation.

Introduction

In what has become one of the most famous evolution papers ever published, Theodosius Dobzhansky (1973) boldly declared that *Nothing in Biology Makes Sense Except in the Light of Evolution*. In this article, he makes several predictions about how evolution has and will continue to illuminate biological research, and that future research will even further illustrate the scientific brilliance of Darwinian evolution. However, have the claims of Dobzhansky stood the test of time?

Now celebrating the 40th anniversary (March 1973) since its original publication in *The American Biology Teacher*, subsequent research has challenged many of Dobzhansky's claims, and has clearly falsified his three predictions: (a) that genetics would confirm Darwin's hierarchical tree of life, (b) that life sciences discoveries would center on evolution-based work, and, of all things, (c) that one Arab Sheik would always believe that the sun orbited the earth.

Dobzhansky's lengthy introduction deals with neither evolution nor biology. Instead, he makes a guilt-by-association charge against creationists by using the laws of planetary motion to make an invalid appeal to authority. "To nonspecialists most of these facts are unfamiliar," he writes and, therefore, concludes that people should trust objective scientists, "those who took the time to study the evidence" (Dobzhansky, 1973, p. 125). Dobzhansky's logical fallacy is the assumption that because the methods of applied science, which have broad agreement on all sides, enabled mankind to reach the moon, evolutionists

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therefore can be trusted in a different field, namely, theoretical ideas on biological origins.

Applied science, however, survives enormous changes in secular theories about the beginning of the universe and of life. Thus, such scientific accomplishment does not depend upon those changing theories of origins.

Darwin's book has an overreaching title, *On the Origin of Species*, for his theory begins with species already in existence. Likewise, the standard models for the evolution of stars typically begin with the explosion of preexisting stars or, at the least, with stars already forming (Bernitt, 2002; Protostar, 2005) and with the chicken-or-egg uncertainty of which came first, the galaxies or the stars (e.g., Maddox, 1998, pp. 48–49). This illustrates that the public's high-level of confidence in secular origins stories is not justified. With the fundamental nature of matter, life, physical laws, and space itself still such a deep mystery, then surely the matter of origins is even more obscure to secular science. Dobzhansky thus begins with the logical fallacy of an unjustified appeal to authority.

His first prediction regarded Saudi Arabia's late Sheik Abd el Aziz bin Baz, who had recently insisted that the sun orbited the earth. Dobzhansky declared that it would be useless to present evidence to those who "fear enlightenment," asserting that the Sheik was "so hopelessly biased that no amount of evidence would impress him" (Dobzhansky, 1973, p. 125). However, in 1985 the U.S. invited Prince Sultan bin Salman to fly aboard the space shuttle *Discovery*. Later, hearing a firsthand account of the evidence from a source that he trusted, bin Baz changed his mind, falsifying Dobzhansky's prediction (Bin Baz, 2005).

Dobzhansky judged correctly that the sheik had been "ignorant of the evidence," but science literacy is not a good predictor of the public's acceptance of politically correct views, such as human-caused global warming or humans evolving from ancestral primates. A National Science Foundation study reported in the journal *Nature Climate Change*, concluded: "As respondents' science literacy scores increased, their concern with climate change decreased" (Kahan et al., 2012 p. 732). The NSF may not want to fund similar research related to Darwinism because of findings in recent studies by evolutionists at leading institutions.

First, 60% of U.S. public school biology teachers would rather not teach evolution (Berkman and Plutzer, 2011). Second, most U.S. medical doctors believe that God was involved in the origin of humans, and 60% reject a strictly secular Darwinism (Poll, 2005; Witt, 2005). And in 22 years of hosting a daily talk radio program, not one of the many evolutionist callers who brought up carbon dating knew that 14C, with its half-life of 5,730 years, is useful to date objects only thousands of years old, not millions, as commonly assumed.

After using the sheik example to imply that all creationists are guilty of ignorance of the evidence, Dobzhansky's next criticism is arbitrary because he directs it only at creationists. Given the widely recognized resistance of scientists to discard disproved paradigms, he could have been describing secular scientists when he wrote, "some people fear enlightenment, because enlightenment threatens their vested interests" (Dobzhansky, 1973, p. 125). As thoroughly documented, the scientists willing to risk their "vested interests" are those who have hurt their careers by publicly airing their scientific challenges to Darwinism (Bergman, 2008).

Unwittingly presenting contradictory conclusions in defense of an old universe, Dobzhansky urges the public to place unjustified confidence in the claims that the universe "may have existed… eternally," or contrariwise, that it only existed for a comparatively brief moment of "10 billion years" (Dobzhansky, 1973, p. 125). That extreme flexibility in dating demonstrates secular-minded comfort with near infinite elasticity in interpreting data. That range, from 10^9 to 10^∞, acceptable to many old-earthers including Dobzhansky, dwarfs the comparatively modest disagreement between big bang advocates and biblical creationists, of between 10^4 and 10^9 years. Yet Dobzhansky exuded confidence in fields of science outside of his own area, such as geology and astronomy, even though the age range estimates he provides indicate the tenuous nature of his claims.

Forty years later, cosmologists are so eager to defend their claim of materialistic origins that many posit far more than 10^{500} entire parallel universes (Linde and Vanchurin, 2009; Gefter, 2009) and hope that explains why our universe, so well designed for life, happens to exist. Dobzhansky failed to see that pursuing strictly naturalistic assumptions would lead anti-creationists to make increasingly over-the-top, wildly elastic interpretations from the data to explain the exceedingly unlikely physics necessary for our biological existence, let alone our sentience.

If today's cosmologists would factor in the unlikely appearance of biomolecules (e.g., proteins, lipids, DNA) and their initial reproducibility, all from nondirected and pre-natural-selection chemical processes required to occur during the same time period and in the same micro-location, then their vanishingly insignificant number of 10^{500} universes still could not explain our existence. Septillions upon septillions of universes are merely spoken into existence by the very persons who deny that God has the ability to speak into existence one universe.

Evolutionists have been influenced by Darwin, Dobzhansky, and Dawkins (Dawkins, 2009) to offer assertions and analogies as though they carried the force of evidence. "Contrary to Bishop Ussher's calculations, the world did not appear in approximately its present state in 4004 BC" (Dobzhansky, 1973, p. 125).

Yet short-lived Carbon 14 is everywhere it is not supposed to be (Baumgardner, 2005), including in the interior of diamonds (Sarfati, 2006).

Dobzhansky (1973, p. 125) also claimed that "the origin of life on earth is dated tentatively between 3 and 5 billion years ago." That wide range should lead evolutionists to wonder whether this conclusion is from a scientific or a philosophical dating method. A star like our sun has about ten billion years' worth of (extraordinarily efficient nuclear) fuel. Over the decades since Dobzhansky, astronomers have danced awkwardly, trying not to step on evolutionist toes. Consuming fuel over four billion years changes the nature of the sun's core. Dobzhansky ignores this faint young-sun problem first publicized by Carl Sagan in 1972. Physics calculations show that the sun would have been 30% cooler that long ago, insufficiently warm to allow for liquid oceans, contradicting the stories of evolutionary geology, paleontology, and the origin and spread of life. Geologists, paleontologists, and oceanographers report no evidence of iced-over oceans on a frozen earth (e.g., Faulkner et al, 2009; Oard, 2011).

Ice reflects far more of the sun's rays back out into space than rock, vegetation, soil, and water, all of which readily absorb sunlight. If the earth had an ice cover, it would deflect the heat required to thaw and would still be frozen. The physics for the faint young sun are not controversial (Faulkner et al., 2009), but the stress it puts on evolution is. The technique evolutionists widely use for dealing with the problem is to propose fine-tuning secondary assumptions, beginning with ammonia in the oceans (Sagan and Mullen, 1972), to greenhouse gases, to lost solar mass, or a just-so changing relationship of energy output, solar wind, atmospheric conditions, and cosmic rays (Faint Young Sun Paradox, 2005).

Dobzhansky (1973, p. 125) put much faith in "the estimates of… the duration of… paleontologic eras, and of the antiquity of man's ancestors" which he said, "are now based mainly on radiometric evidence." That evidence and interpretation is based on selective data and even in 1973 showed great inconsistencies. During the decades since, creationists have widely publicized these anomalies, which are everywhere. New rock can date a million years old, and the same rock flow in the Grand Canyon's inner gorge gives contradictory dates 1.5 billion years apart (Snelling, 2004). Rock atop the Grand Canyon dates older than rock in the bottom strata. Experiments demonstrate that radioisotope half-lives are inconstant (Brown, 2010; Woodmorappe, 1999), and laboratories measure significant levels of ^{14}C in diamonds, natural gas, marble, coal, dinosaur fossils, etc. (Baumgardner, 2005; Enyart, 2012).

Dobzhansky failed to credit Christian creationists, like Copernicus, Kepler, and Newton, who ended the science-stalling reign of geocentrism that the world received from pagan theorists like Plato (Spindle of Necessity, 2004) and Ptolemy. Unlike the old-earth geologists Dobzhansky trusted who make excuses for the ubiquitous "anomalies" in their data (like ^{14}C everywhere it should not be), Kepler refused to ignore the anomalies in planetary orbits because he was willing to put the actual data above the reigning paradigm. As a result, he discovered the laws of planetary motion and freed our intellects from superficial but entrenched interpretations of nature. And like Newton, Galileo's revolution was not against the Bible but, as in his *Dialogue Concerning the Two Chief World Systems*, against the geocentric views of a character he called Simpleton (i.e., defenders of Aristotle). So, while failing to credit leading creationists for defeating geocentrism, Dobzhansky (1973, p. 126) referred to a lesser author's discredited book *Omphalos* as "early antievolutionist" because two years before Darwin's *Origin of Species* it claimed the fossil record was created to give an appearance of age (Gosse, 1857, pp. 369–370). Thus, the article's introduction ends with another attempt to convict modern creationists through guilt by association.

The introduction of Dobzhansky's revered article, therefore, is wrong on its first prediction and uses the logical fallacies of guilt by association, arbitrary accusation, and unjustified appeal to authority.

Diversity of Living Beings

Dobzhansky then presented his argument for evolutionary biology with claims that are now easily seen as unscientific, arbitrary, and circular. Dobzhansky (1973, p. 126) writes, "The diversity and the unity of life are equally striking." He fails to acknowledge that evolution predicts neither biological unity nor diversity. As described twenty years ago by information specialist Walter ReMine (1993, p. 350), evolution theory merely accommodates such observations after the fact, "like a fog adapts to a landscape."

Then, just like a creationist, Dobzhansky describes with awe the range of life from microorganisms to whales. Because he is claiming to present evidence against the belief that a brilliant Creator designed the great diversity of life, it is therefore arbitrary for him to imply that the wonder of life is evidence against creation and for evolution.

Creationists have long documented that evolutionists frequently argue in circles. For example, when trying to account for the unexpected complexity of life, they typically invoke far greater complexity. To account for a single living cell, some appeal even to space travel and alien civilizations (Crick and Orgel, 1973). To explain astounding cellular biology, countless evolutionists from DNA co-discoverer Francis Crick to pop-science author Richard Dawkins have speculated that a long time ago "somewhere in the universe," aliens may have "designed a form of life that they seeded onto perhaps this planet" (Bob Enyart Live, 2008). Then, hoping to explain the unexpected complexity and perfectionist fine-tuning of the universe, secularists appeal to multi-trillions of parallel universes (Multiverse, 2002). They ignore that they are invoking even greater unobserved complexity to explain what we do observe. They also seem unaware that they are not answering the origin-of-life question when they propose that life is too complex to have originated here on the hospitable earth, so it must have begun elsewhere.

Forty years ago the infant field of molecular biology gave glimpses of the bewildering complexity of living cells. In that context we come to the "highly significant" evidence offered for the claim in Dobzhansky's title. He argued that, because of the uncertainty of how to characterize viruses, which are on "the borderline between living and inanimate matter," they therefore are evidently at the simple end of the "simplicity-complexity spectrum" (Dobzhansky, 1973, p. 126). This *non sequitur* is also somewhat circular. Dobzhansky admits that a virus must "subvert the biochemical machinery of the host cells" (Dobzhansky, 1973, p. 126). Therefore, the viral world requires greater complexity (including the host cell), not less, than the world of single-celled organisms. The ensuing four decades of research have increasingly shown the complex sophistication both in the cell and the virus itself (Sarfati, 2008). Dobzhansky's commitment to evolution has clouded his ability to see that the greater complexity of the virus/cell system logically does not "obliterate" the physical hurdles to abiogenesis. Furthermore, because a virus cannot reproduce on its own, by definition it cannot originate on its own by Darwinian mechanisms (Bergman, 2000).

If life could arise only if the right chemicals could amass together, then the earth should be popping with new life-forms. At every moment of every day, millions of carcasses and quintillions of cells are in every possible stage of decomposition, bringing together all of the right chemicals. Yet no new life appears. Decades of investigation into abiogenesis research has not generated excitement for Dobzhansky's carefully unstated implication, that by a materialistic process molecules somehow can bridge the gap from the inanimate to the animate. Even the recent synthesis of building-block ribonucleotides (Powner et al., 2009) required many steps in an intelligently designed laboratory experiment, which, regardless, did not even approach the question of the source of biotic information that such nucleotides must possess to support life. Far from evolutionists having shown forty years ago that such a gap is bridgeable, the abiogenesis field is now stagnant, lacking funding, new ideas, and anything close to a consensus. Instead, the mounting scientific knowledge has greatly increased the known abiogenesis hurdles, which is why evolutionists appeal to aliens and, increasingly, to an almost inexhaustible number of universes.

Dobzhansky (1973, p. 126) wrote, "the human brain has some 12 billion neurons; the synapses between the neurons are perhaps a thousand times as numerous." Neurologists today estimate we have closer to 100 billion neurons with 100 trillion synapses. He also estimated that, "between 1.5 and 2 million species of animals and plants have been described," guesstimating the actual number at perhaps twice that (Dobzhansky, 1973, p. 126). Although rainforest research has produced downward estimates of insect diversity (Novotny et al., 2002), across all domains of life, scientists identify about 18,000 existing species annually, increasing the total number known to about 1.9 million and leaving perhaps two to ten times (or more) of that number of species undiscovered (Chapman, 2009).

Dobzhansky (1973, p. 126) asks what can explain this "colossal diversity" and the many "biological curiosities." He describes their existence with the non-scientific terms "whimsical," "superfluous," and "jocular," implying that such characterizations are, first, accurate and, second, that they scientifically favor evolution over creation. But how does science determine if something is whimsical? Dobzhansky presents no scientific or theological reasons why a brilliant Creator should not be expected to fill the world with millions of curiously diverse creatures. So he presents another *non sequitur*: "The only explanation that makes sense is that the organic diversity has evolved in response to the diversity of environment" (Dobzhansky, 1973, p. 126). This is philosophy, not science. Claiming that such diversity favors evolution over creation would be relevant only if creation science required that God could not enable a fine-tuning of life to fill very diverse environments. Robustness in both economics and ecology increases as systems incorporate greater variety. Dobzhansky never deals with the obvious "diversity-is-our-strength" rebuttal to his claim.

Creationists frequently notice Darwinists amassing evidence that precisely fits the biblical model but then arbitrarily claiming it as evidence for evolution, a curiosity Darwinism does explain. In a fallen world, those who discount the Creator's actions are most fit to survive in godless institutions (Bergman, 2008). So Dobzhansky (1973, p. 126) interprets all life as selection from nondirected change: "the environment presents challenges to living species, to which the latter may respond by adaptive genetic changes." But creationists quickly point out the limits to biological adaptation—that organisms could not survive while evolving vital organs; and that, heading back down the fitness terrain, you would get non-functional legs long before you get functional wings.

Dobzhansky (1973, p. 127 & 129) continues to speak of "extravagant surfeit" and of "caprice" and uses another unscientific term, "overspecialized," even for species that survive very well. Also, he lost track of which worldview he was opposing.

> The evidence of fossils shows clearly that the eventual end of most evolutionary lines is extinction. ... All this is understandable in the light of evolution theory; but [he claims] what a *senseless* operation it would have been, on God's part (Dobzhansky, 1973, p. 126).

His argument, though, was already fully rebutted 3,500 years ago in Genesis chapters 3, 6, and 9, and 2,000 years ago by Jesus Christ in the New Testament, and elsewhere in Scripture. Dobzhansky seems unaware that creationists squarely respond to the artifact of the geologic record as the result of the global Flood. This is ironic because while Dobzhansky claimed to be a Christian, he took it upon himself to publish against the young-earth movement; yet he was writing more than a decade after Whitcomb and Morris wrote *The Genesis Flood*.

The biblical creationists he intended to mock by referencing Bishop Ussher's "4004 BC" date for Genesis 1 maintain that the Earth suffered a global Flood by God's judgment, which directly explains an extinction event that scientists have now independently identified. Called "the largest mass extinction in Earth history, with the demise of an estimated 90% of all marine species" (Brennecka et al., 2011, pp. 17631; see also Stanley, 2007), its witness on land includes the mass burial of dinosaurs with clams, seashells atop the world's major mountain ranges, and billions of dead things buried in rock layers laid down by water all over the earth (Ham, 1987).

Dobzhansky uses a fungus, a beetle, and flies to make one of his main arguments, that they are "overspecialized." He applies this nonscientific term to species that he would presume have survived thousands of times longer than did the Roman Empire. By what scientific criteria can he criticize them as overspecialized? He then builds on his philosophical claim with a raw assertion that "only a creative and blind process could produce, on the one hand, the tremendous biologic success that is the human species and, on the other, forms of adaptedness as narrow and as constraining as those of the overspecialized fungus, beetle, and flies" (Dobzhansky, 1973, p 127). Only a blind process could do all that? Certainly, an intelligent Creator could.

"Perhaps the narrowest ecologic niche of all is that of a species of the fungus family Laboulbeniaceae, which grows exclusively on the rear portion of the elytra [hardened forewing] of the beetle *Aphenops cronei*, which is found only in some limestone caves in southern France" (Dobzhansky, 1973, p. 126). Fact checking Dobzhansky's specific claim is difficult because that particular species of beetle is not listed in the *Encyclopedia of Life*, or in *Biodiversity Heritage Library*, or in wikispecies.com, or (according to a Google search) anywhere on the Web. The genera *Aphaenops* exists (also spelled *Aphoenops*), but a *cronei* species is not to be found. As an aside, marine animals *Croneisella*, *Croneisigenys*, *Croneisites*, and *Cronia* do appear (Sepkoski, 2002, p. 404; Global Names Index, 2012). Moreover, Dobzhansky did not identify which of the widely distributed Laboulbeniaceae fungi species he was referencing. Species "inflation," which required leading scientists to reduce a list of over 1,000 named dinosaurs to about 500 (Benton, 2008; Amos, 2008), is a known problem of fungi in the south of France, including those parasitic to beetles in caves in the Pyrenees (Santamaria and Faille, 2007). Regardless of whether Dobzhansky's fungus is more prevalent than he assumed, he did not even attempt to show how a narrow niche would be scientific evidence favoring evolution over creation.

Then, describing a fly that lives in oil in California, Dobzhansky omitted the interesting detail that the fly eats insects that get trapped in the oil. Such flies perform yet another ecosystem cleanup mission, as is true of a million species filling countless niches from vultures and sea cucumbers to insects and microbes. Scavenger crews clean up environments worldwide. But Dobzhansky does not explain why the fittest organisms surviving would naturally evolve to become part of a complex, self-cleaning ecosystem. Darwinism allegedly explains aggression, as claims Richard Dawkins in *The Selfish Gene*, and altruism, as claims Edward Wilson in *Sociobiology*, yet the extremely indirect benefits to one species from a cleaner environment for all species surely would be as difficult for natural selection to sense as it would be for a princess to feel a pea under her mattress. Regarding "natural selection," Dobzhansky (1973, p. 127) admits that, "species are produced not because they are needed for some purpose," beyond themselves.

Likewise "larvae of the fly *Drosophila carciniphila* develop only in the nephric grooves beneath the flaps of the third maxilliped [claws] of the land crab *Geocarcinus ruricola*, which is restricted to certain islands in the Caribbean" (Dobzhasky, 1973, p. 127). If niche living, however, resulted from natural selection operating on random mutations, evolutionists would be surprised to find out that different phyletic lines of flies allegedly independently evolved to live in similar ways on crabs. Reports from 1974 and again in 2008 indicate that Dobzhansky's fly is only "one out of three known fruit flies that have found a home on (and inside of) land-crabs" (Stensmyr et al., 2008, p. 1; see also *Science Daily*, 2008), and of the thousands of fruit fly species (most of which actually feed on microbes), another living on a crab also shares a similar geographic home on Grand Cayman Island in the Caribbean.

Evolutionists claim "it is intriguing that two species in the same lineage evolved the same odd choice of breeding substrate" (*Science Daily*, 2008). A colleague of Dobzhansky's, reported,

> Three species of Drosophila have accomplished an innovation in that they breed … on tropical land crabs. This could be dismissed as curious aberration were it not for the fact that the three flies concerned represent three different phyletic lines of the family (Carson, 1974, p. 3517).

Finding multiple flies that allegedly evolved similar behavior cannot be both clear evidence and an intriguing aberration. The Carson paper would have correctly concluded if the word "adapt" had been used instead of "evolve," for it proposed that "genetic systems of many conservative groups of organisms carry variability that would permit them to evolve [adapt] in a novel direction" (Carson, 1974, p. 3517). God designed, in organisms, the ability to adapt, and that is why so many can do so rapidly. Dobzhansky misses the point when he claims, "there is, of course, nothing conscious or intentional in the action of natural selection" (Dobzhansky, 1973, p. 127). He incorrectly credits the environment, via natural selection, for the adaptive ability of the organism itself (Guliuzza, 2011). Just as a civil engineer can identify a planned community as compared to the early metropolitan areas that grew more haphazardly, so too the consistency of organisms filling ecological niches and widespread symbiotic relationships point to the omni-competent design of the genetic and epigenetic information that permit adaptation into novel directions. Dobzhansky's faith in the creative power of natural selection is no longer shared even by all leading evolutionists (ReMine, 2012b).

Dobzhansky (1973, p. 127) then makes the common straw man attack, alleging antievolutionists, "fancy that all existing species were generated by supernatural fiat … pretty much as we find them today." However, even Dr. Eugenie Scott's virulently anti-creationist National Center for Science Education acknowledges that "many creationist thinkers of the classical period through to the 19th century thought that species could change" (Wilkins, 2006, p. 36). And further, "what is more, nothing in the biblical or theological traditions requires that species are fixed, only that kinds exist, which neither evolutionists nor traditional creationists ever denied" (Wilkins, 2006, p. 36). Dr. Henry Morris, perhaps the world's most famous young-earth creationist, had written more than a quarter of a century earlier, "the Bible does not teach the fixity of species" (Morris, 1946, p. 48). Oxford fellow and author of *Plato*, David Ritchie wrote, "the biological doctrine of the fixity of species, in the stiff dogmatic form which modern evolutionary theories have overthrown, is, in fact, the direct historical descendant of Plato's theory" (Ritchie, 1902, p. 91). While Plato cannot escape blame for geocentrism, Ritchie did not hold him responsible for the later fixity dogmatism, yet by way of "forms" and "essentials" even his protégé Aristotle was used to advocate for fixity (Garner, 2009). Darwin's own mentor, Charles Lyell, was a fixity proponent, as were many professional scientists of that day (Sapp, 2003, pp. 20, 30).

Following Dobzhansky, evolutionists today exploit the history of fixity to smear modern creationists, a confusion that results in part from language translations and the change in the meaning of terms through history. The Bible speaks of created "kinds" from the Hebrew word *min*, long translated into Latin by the word *species*, *genera*, and *genus*, the latter also being a Greek term. From Jerome in about AD 400, to Calvin in the 1500s, and for centuries afterward, Christians have used these terms for the Bible's "created kinds" (Hodge, 2009). The father of modern biology, creationist John Ray, was the first to define *species* specifically for biology. Later, the father of biological classification, creationist Carl Linnaeus, brought *species* and the term *genera* (*genus*) into widespread use for systematic taxonomy.

However, the meaning of *species* has changed over time to where it no longer identifies created kinds but subgroups. Both Ray and Linnaeus later in their careers recognized change within species (Bell, 2003); and in his 12th edition of *Systema Naturae* Linnaeus indicated that *genus*, as opposed to *species*, would be closer to the created kind (Wood and Garner, 2009). But whereas the entire creation movement and leading creationists for decades, and even centuries, including Morris, G. W. Carver, and Francis Bacon (Kelsey, 2009, p. 163), would agree that, for example, plants and dogs change, they all deny that regardless of the time allotted, a plant could change into an animal or that the created dog kind could change into cat or the turtle into alligator.

Dobzhansky rejected the existence of a personal God and life after death (Ayala and Fitch, 1997). Yet he engaged in a theological questioning of a creator by asking, "What is the sense, of having as many as 2 or 3 million species living on earth?" (Dobzhansky, 1973, p. 127). This is an intelligent design argument, used poorly and in reverse. His argument is that good design would have fewer species; so, millions of species point to no design. Evolutionists are being arbitrary when they disapprove design arguments yet frequently use them for their own conclusions. Evolutionists are comfortable with Darwin, Dobzhansky, and Dawkins using design arguments to support evolution.

An economy with many, or even thousands, of providers of vital goods and services is far more robust than another, say under communism, which denies freedom and has few such providers. As a former program manager for Microsoft Corporation, it is easy to notice that the redundant ecological services provided by *multitudes* of species help to achieve the Creator's nonfunctional design requirements.

The intelligent design of hardware and software engineers facilitates the *-ilities* of an entire computing system, including reliability, scalability, exploitability, extensibility, availability, maintainability, modifiability, compatibility, and stability.

Consider, though, in rejecting intelligence, Dobzhansky is forced to hand-wave away the law of biogenesis and the unfathomable hurdles that life would need to cross to arise from nonlife (Bergman, 2000; Christen et al., 2011; Shirber, 2012). Even if an assembly line of trillions of worlds filled with random chemical reactions finally assembled and folded a first protein into a usable form after billions of years, all you would have is a nonliving protein molecule. Life comes only from life.

Earth's deceased organisms have untold quadrillions of dead proteins decaying, yet nothing ever comes of them. And—forget billions of years and trillions of worlds—everything needed to form a first reproducing organism would all have to be present at the same moment in the same microsphere. Consider also that environmentalists warn of the ecological stress from the extinction of a single species. Yet believers in materialistic origins discount that the first emerging organism would have *not even one single other species* to provide it with biological services (e.g., Zuill, 1999, pp. 61–74). Forget the circle of life. Forget a diverse diet. And then, for such an undirected process to create life on Earth, it must also achieve the *ilities*, which is absurd in the highest degree from an engineering perspective.

In their war against the atheists who were more amenable to theistic evolution, the new atheists like Richard Dawkins and the late Christopher Hitchens are prevailing (i.e., selling more books). So, it is doubtful that Dobzhansky would get as warm a reception today if he wrote, "evolution is God's, or Nature's method of creation" (Dobzhansky, 1973, p. 127). Yet he never explains why diversity is evidence against creation instead of for creation. Dobzhansky does not say whether God would have to completely avoid niche species to meet with approval. His article is a good example of anti-creation authors who fail to distinguish evidence from rhetoric and who present their conclusions as though they were argumentation. By presenting interpretations as though they were observations, evolutionists create the illusion of scientific proof by misdirecting the readers' attention (ReMine, 1993).

Unity of Life

Dobzhansky (1973, p. 127) also offers a contradictory assumption that ubiquitous DNA suggests, "that life arose from inanimate matter only once." Then he adds contrariwise that "it is also possible that there were several, or even many, origins of life" (Dobzhansky, 1973, p. 127). Again he offers his conclusion as though it were evidence.

> If there was no evolution … the antievolutionists must again accuse the Creator of cheating. They must insist that He deliberately arranged things exactly as if his method of creation was evolution, intentionally to mislead sincere seekers of truth (Dobzhansky, p. 127).

In this statement Dobzhansky momentarily switches sides to pretend, in the most transparent way, that he is not the one who would be accusing God. Yet he is. If evolution did not occur, as he believes, he is the one who without justification would accuse God, whereas creationists have long argued that claims about abiogenesis and about fossils being buried in an evolutionary pattern are façades. If man did not evolve from an apelike creature, then Dobzhansky (1973, p. 129) is the one who proposed the alternative explanation for Hawaii's fauna: "In a fit of absentmindedness, the Creator went on" to create a myriad variety of fruit flies. Perhaps by his own forgetfulness, though, Dobzhansky (1973, p. 128) offered no justification for why he assumed that "biochemical universals" are "the most impressive" evidence for evolution and against creation.

Dobzhansky is the man most credited with developing today's reigning paradigm called neo-Darwinism, the evolutionary synthesis that brought Darwin into the DNA age (Modern Evolutionary Synthesis, 2002). Yet by overselling and misinterpreting the genetic science of his day, he led many scientists to believe that the rudimentary sequencing data initially collected had already cast the deciding vote for evolution. "Molecular studies have made possible an approach to exact measurements of degrees of biochemical similarities and differences among organisms" (Dobzhansky, 1973, p. 127). In an interview, geneticist Mary-Claire King recalls that in the early 1970s evolutionists began reporting (something later falsified) that people and chimps "share 98/99% of our genetic material" (King, 2009). Over the next decades Dobzhansky's supporters shouted exaggerated extrapolations from protein-coding DNA segments to claim proof of human evolution. Yet, now science has learned that 70% of sponge genes match ours, including genes to build structures that sponges lack, like nerves and muscles (Srivastava, 2010). Smithsonian paleobiologist Douglas Erwin admits that this "flies in the face of what we think of early … evolution" (Mann, 2010, p. 673). Today's evolutionists constantly express surprise over their genetic findings, falsifying Dobzhansky's second expectation that DNA evidence would reinforce the claimed Darwinian lineages. Instead, multiplied discoveries, such as those listed in Table I, have led many career evolutionists to admit that Darwin was wrong about the tree of life (Lawton, 2009).

Dobzhansky (1973) trumpeted a tiny set of genetic data points from which he drew scientifically irresponsible conclusions. He incorrectly extrapolated from

Table I. Summary of comparative genomics of human and various animals.

- Horse DNA is closer to bats than to cows (Nishihara et al., 2006).
- The chimp Y chromosome is “horrendously different” from our “Y,” with 30% that does not align (Buchen, 2010).
- Kangaroo DNA unexpectedly contains huge chunks of the human genome (Cooper, 2008).
- Neanderthal DNA is closer to human than a chimp is to a chimp (Carter, 2009).
- The roundworm has far more genes than Darwinists presumed, 19,000 compared to our 20,500 (Human Genome Program, 1999).
- The flatworm genome has “alarmed” evolutionists, dislodging the “man-bug ancestor” from its place at the base (Maxmen, 2011).
- A UC Davis study compared 2,000 genes common to humans, frogs, sea squirts, sea urchins, fruit flies, and nematodes to construct an evolutionary tree. They failed because “different genes told contradictory evolutionary stories” (Lawton, 2009, p. 39).

the tiny region of DNA for 18 species that codes for cytochrome c, whereas, as indicated above, the tens of thousands of genes and billions of base pairs from the nearly two hundred species now fully sequenced often tell stories that contradict Dobzhansky’s. He also wrote that “alpha chains of hemoglobin have identical sequences of amino acids in man and the chimpanzee, but they differ in a single amino acid (out of 141) in the gorilla” (Dobzhansky, 1973, pp. 127–128). Since then, however, geneticists have encountered “puzzling surprises,” notably, “15% of human genes look more like the gorilla version than the chimp version” (Smith, 2012).

If Dobzhansky had selected a different group of 141 base pairs, out of billions, perhaps evolutionists would have spent decades claiming that the gorilla was closest to man. For example, had he selected the gene for cytochrome b, he would have found it provided an

> absurd phylogeny of mammals, regardless of the method of tree construction. Cats and whale [fall] within primates, grouping with simians (monkeys and apes) (Lee, 1999, p. 177).

Moreover, evolutionists have proffered cytochrome c type arguments from Dobzhansky’s time until today. These conclusions suffer from insignificantly small data sets, from special pleading of such data (Williams, 2008), and from ignoring the overall crush of conflicting genetic data. Instead of cytochrome c, “if you draw BovB’s family tree, it looks like you’ve entered a bizarre parallel universe where cows are more closely related to snakes than to elephants, and where one gecko is more closely related to horses than to other lizards” (Yong, 2013). As Sarfati (2011, p. 114) presents Michael Denton’s rebuttal,

> When comparing the amino acid sequence of cytochrome C of a bacterium (a prokaryote) with such widely diverse eukaryotes as yeast, wheat, silkmoth, pigeon, and horse, all of these have practically the same percentage difference with the bacterium (64–69%). There is no intermediate cytochrome between prokaryotes and eukaryotes, and no hint that the “higher” organism such as a horse has diverged more than the “lower” organism such as the yeast.

Regarding proteins that are “quasi-universal” and “functionally similar in different living beings” (Dobzhansky, 1973, p. 127), Dobzhansky again seems unaware of the rebuttal that common design points to a common Designer (see Sarfati, 2011, pp. 112–113). Also, the literature today is filled with counter-examples to Dobzhansky’s hemoglobin claim. For example, evolutionists would not expect the same amino acid sequences for echolocation in bats and dolphins (Liu et al., 2010), nor the exceedingly unique coding for an antigen receptor found both in camels and llamas—and sharks (Flajnik et al., 2011).

Comparative Anatomy and Embryology

Again, in this section of his famed paper, Dobzhansky (1973, p. 128) fails to recognize that similar designs, such as with “homologous bones in … man and bird” could be evidence of a common Designer. Perhaps he omitted that creationist explanation because he disagreed with it. However, he carefully describes an evolutionist claim that he appears to disagree with, Ernst Haeckel’s “so-called biogenetic law” (Dobzhansky, 1973, p. 128) that the embryo visibly reenacts its species’ stages of evolution with monkey tail, fish gills, yolk sac, etc. What survival advantage would natural selection confer by the embryo putting on such a show? Dobzhansky (1973, p. 128) admits that this bizarre yet die-hard theory “is no longer credited,” but he softens this fact by adding, “in its original form." And again, he presents an observation that fully supports creationists' claim of a common Designer, but he pretends that it supports only evolution. "The sedentary barnacles … pass through a free-swimming larval stage," and since at that stage they "look unmistakably similar" to a one-eyed freshwater crustacean called a Cyclops, they "are evidently relatives" (Dobzhansky, 1973, p. 128).

At this point in his article the gill slits reemerge. He claims "the presence of gill slits in human embryos … is another famous example" (Dobzhansky, 1973, p. 128). Within a single paragraph, the "biogenetic law" is back and re-credited with Haeckel's primary claim of fact, which has been refuted by embryologists because the human embryo never develops gills or gill slits. This world-renowned evolutionary biologist was flatly wrong. Even Dawkins (Dawkins and Wright, 2010) admitted that Haeckel—ironically the founder of the Association for the Propagation of Ethical Atheism (Kaiser Honors Haeckel, 1907, p. 1)—published drawings that were a "mistake" and that it "was a mistake" for textbooks to have introduced them. Haeckel was publicly confronted with his fraud by a credentialed anatomist, and his drawings were again proved fraudulent in 1997 by a team assembled by a St. George's Hospital Medical School embryologist (Grigg, 1998, pp. 49–51). Searching the classic, *Grey's Anatomy*, for "gills" and "gill slits" returns "no results found." As could be done with the development of most anatomical structures, like the heart, limbs, and eyes, evolutionists simply identify analogous structures in various species and then claim that those somehow vindicate Haeckel's theory. Today, even the virulently anti-creationist Wikipedia rejects both Haeckel's recapitulation theory and his human gill slits claim (Recapitulation Theory, 2001; Pharyngeal Slit, 2005). And years before Dobzhansky's article, his own colleague and fellow architect of the modern synthesis, famous evolutionist George Gaylord Simpson, had concluded, "it is now firmly established that ontogeny does not recapitulate phylogeny" (Simpson and Beck, 1965, p. 241). Yet millions of students are still taught recapitulation and the human embryo gill slit claim, apparently because Haeckel's and Dobzhansky's illusions are "too big to fail."

Then, irresponsibly ignoring decades of evolutionists who had falsified Haeckel's claim, Dobzhansky asks, "Why should it have unmistakable gill slits unless its remote ancestors did respire with the aid of gills?" (Dobzhansky, 1973, p. 128). Since it does not, then perhaps they did not. Dobzhansky's defenders should admit that the baby in the womb does not have respiratory slit remnants. Again, specific evidence Dobzhansky relied upon turns out to be wrong.

Strength and Acceptance of Evolutionary Theory

Evolutionists have faithfully repeated Dobzhansky's allegation that creationists "string … together quotations, carefully and sometimes expertly taken out of context" (Dobzhansky, 1973, p. 129). However, quote mining, as with any mining, is most fruitful when the vein is deep, rich, and wide. Leading evolutionists continue to make knee-jerk reactions against references from creationists even, as is typical, where no one has implied that the evolutionary scientist being quoted has now rejected Darwinism. Significantly, we quote the testimony of hostile witnesses because these statements tend to be the most credible for an evolutionist.

Dobzhansky's penultimate claim was to psychoanalyze science-educated creationists, alleging that they reject evolution either due to "emotional blocks" or "bigotry," and his concluding paragraph praises "one of the great thinkers of our age, Pierre Teilhard de Chardin" (Dobzhansky, 1973, p. 129), whose mistakes include introducing to the world the "missing link" called the Piltdown Man. Both Gould and Louis Leakey cast suspicion on this "great thinker," without proof, of being involved in perpetrating the fraud (Birx, 1997). Dobzhansky (1973, p. 129) quotes de Chardin: "Is evolution a theory …? It is much more—it is a general postulate to which all theories … must henceforward bow … Evolution is a light which illuminates all facts." Interestingly, while it would not have occurred to Dobzhansky, it was not evolution theory but intelligent design (ID) methodology, identifying "intent" as opposed to otherwise "natural causes," that illuminated the fact that Piltdown Man was a fraud (see ReMine, 1993, p. 30).

Ironically, *Nature* published a 2006 letter from a German biology professor urging that, "young-Earth creationists … should read the 1973 essay in which Dobzhansky—an open-minded, non-dogmatic theist—thoroughly refuted their irrational claims" (Kutschera, 2006, p. 26).

Finally, to address head-on Dobzhansky's primary claim, that "nothing in biology makes sense except in the light of evolution," consider first the technologies of biology and medicine and, second, the last four decades of applied biology and actual discoveries. Hundreds of technologies and inventions were enabled by the discoveries of Kepler, Bacon, Galileo, Harvey, Pascal, Boyle, Newton, Dalton, Faraday, Pasteur, Joule, Kelvin, Lister, the Wrights, and Carver—all creationists. What invention or technology required Darwinism? Even the medical technologies and inventions like Pasteurization, X-ray, EKG, blood transfusion (think William Harvey), EEG, MRI (creationist Raymond Damadian and others), DNA sequencing, the Gene Gun (Cornell's creationist John Sanford), required nothing from Darwin. Rather, heavy-handed evolution theory cost thousands of Christians a future in science (Bergman, 2008), cost millions of people their tonsils, and billions of DNA base pairs labeled as "junk" their rightful attention.

Just as the Marxists spent decades inventing economic interpretations of everything, so too evolutionists endeavor to create Darwinian explanations for everything (Prager, 2012), except for Darwinism itself, which explanation would be survival of the politically correct. Ignoring Darwinian narratives of alleged deep time and considering instead actual biological discoveries, such as those that earn Nobel Prizes, evolution is surprisingly irrelevant according to dozens of the world's leading scientists, as assessed by a member of the prestigious National Academy of Sciences. Philip Skell reports that he "asked more than 70 eminent researchers if they would have done their work differently if they had thought Darwin's theory was wrong. The responses were all the same: No" (Skell, 2005, p. 10).

Decades worth of Nobel Prizes awarded for discoveries in the life sciences falsify Dobzhansky's third and key expectation, that nothing in biology would make sense apart from evolution. Those awards track worldwide progress in biology and therefore should be able to catalog amazing evolution-based discoveries. However, the late Pennsylvania State University professor Dr. Skell summed up the actual history of the Nobel Prize in physiology and medicine.

> I decided to explore this further by examining the 100 Nobel Prizes in biology-related areas over the last century. And I could not find among them any that had been awarded the Nobel Prize for their breakthrough discoveries that I could recognize depended upon Darwinian concepts to design the experimental work on which their discoveries were based. … So here again, the Darwinian theory did not provide the guidance that was necessary for those great breakthrough discoveries (ID the Future, 2007).

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The Origins and Genetic Functions of Pseudogenes

Jerry Bergman*

Abstract

Pseudogenes are genes that ostensibly lack the transcription or translation machinery required to produce protein. They are often used by Darwinists as evidence for the wasteful process that resulted from the evolution of the genome and, indirectly, as evidence for common descent because they appear to be evolutionary leftovers of past evolution life-forms. Recent research indicates that some or many pseudogenes do have a function, and several functions are discussed.

Introduction

Human genome mapping has identified enormous sections of DNA that do not code for proteins. This observation has been heralded as support for evolutionary naturalism (Wells, 2011). Called junk DNA (or non-informational DNA), it includes DNA sequences such as introns, repeated sequences, and pseudogenes (Bergman, 1994, 2001; Doolittle, 1993). Pseudogenes are a specific type of DNA; although very similar to protein coding genes, they are believed to be damaged genes and, as a result, no longer able to encode for protein (Chen et al., 2002). Although pseudogenes lack promoters and/or enhancers and appear to have crippling mutations such as frame shifts or premature stop codons, they "do tend to retain their characteristic intron-exon structure," which gives a hint of their function (Pink et al., 2011, p. 792).

Pseudogenes are an important topic in the creation-evolution controversy because neo-Darwinists commonly argue that a creator would not have created pseudogenes. Rather, they are the result of a blind, purposeless mechanism, such as evolution. Specifically, neo-Darwinists postulate that pseudogenes are evolutionary relics, molecular fossils that have accumulated during deep time and therefore can be used to help determine evolutionary history or phylogeny (Lee, 2003). This view interprets them as "long-dead genes ... that litter our chromosomes ... vestiges of old code associated with defunct [genetic] routines" (Gerstein and Zheng, 2006, p. 49).

History of Pseudogene Research

Pseudogenes were first reported in the literature by Jacq et al. (1977). In the years since this report, large numbers of pseudogenes have been identified in humans and a wide variety of other species. All animals, especially mammals, contain a large number of pseudogenes, but only a few putative pseudogenes have been identified in bacterial genomes (Andersson and Andersson, 2001, p. 829). The current estimate is that about 20,000 pseudogenes exist in humans alone, close to the number of functional genes (Svensson et al., 2006; Hirotsune et al., 2003). Because pseudogenes have sequences very similar to functional genes, they are often labeled "dead" or "disabled" genes (Hernandez et al., 1998). Normal genes contain DNA sequences that help to regulate or control the timing of various gene activities.

Pseudogenes appear to lack some or all of these controlling elements, such as a promoter site (RNA polymerase binding site for the start transcriptions), various regulators that control the level

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of protein produced, the specific code for the amino acid sequence of the protein produced during translation, and start and stop codons to control translation (Balakirev and Ayala, 2003; Gibson, 1994). Many pseudogenes also appear to contain extra stop codons (or premature stop signals) or have abnormal or missing flanking regulatory elements (Gibson, 1994).

It is theorized that these pseudogenes resulted from damage to the original genes by mutations, such as frame shifts, insertions and deletions. These mutations can result in gene nonfunctionality. They can also cause modifications that damage regulatory elements, especially initiation and termination sequences. As a result, the gene no longer produces functional proteins.

New research demonstrates that the regulatory DNA sequences are not always in the normal location close to the gene, or that they can always be readily identified. The fact that some of these signals are located a great distance from the gene presents a major difficulty in determining if a gene is a pseudogene. When these regulatory sequences are identified, technically the gene is not a pseudogene, even though it may still be identified as one. Consequently, we now recognize that there is not a clear distinction between genes and pseudogenes (Zheng and Gerstein, 2007).

Their similarity to functional genes has prompted Darwinists to consider pseudogenes evolutionary relatives of normally functioning genes (a reason for their extensive study). Richard Dawkins concludes that pseudogenes “are genes that once did something useful but have now been sidelined and are never transcribed or translated” (Dawkins, 2009, p. 332). In addition, he concluded that, “What pseudogenes are useful for is embarrassing creationists. It stretches even their creative ingenuity to make up a convincing reason why an intelligent designer should have created a pseudogene—a gene that does absolutely nothing and gives every appearance of being a superannuated version of a gene that used to do something” (Dawkins, 2009, p. 332).

Origin of Pseudogenes

Contrary to Dawkins’ assumptions, pseudogenes are not contradictory to creation. The creation model accounts for genome degradation (Sanford, 2005). Thus, it anticipates the existence of some genes that have subsequently lost function since their original creation. This includes the pseudogenes that are categorized as disabled pseudogenes. These pseudogenes are complete genes that appear to be damaged by mutations that prevent transcription or translation. A classic example is the L-gulono-Y-lactone oxidase (GLO) gene in primates and humans that is missing several of the exons to code for a functional enzyme necessary for the manufacture of vitamin C (Cooper, 1999; Nishikimi et al., 1994).

However, not all pseudogenes can or need to be accounted for by degradation. One popular theory proposes that many pseudogenes arose by gene duplication from genetic mistakes, such as an unequal crossover, resulting in an extra copy of a functional gene, which is not immediately eliminated from the genome (see Bergman, 2006). If it did not have a detrimental effect on the organism, the duplicated gene could subsequently accumulate mutations. Mutations that occur in pseudogenes are assumed to be neutral (or near neutral). Thus, the organism would survive even though the mutation load in these genes is assumed to have slowly increased over time.

For this reason, mutations would be expected to accumulate in pseudogenes. The older the pseudogene, the more mutations it would contain. The gene duplication possibility for their origin has been suggested because most pseudogenes were not known to have a function and because pseudogenes are often similar to known functional genes. Gene duplication that results in useful genetic changes may have occurred, but this does not explain the origin of the original gene.

Types of Pseudogenes

Two basic classes of pseudogenes have so far been identified: *unprocessed* and *processed pseudogenes* (Wen et al., 2012).

Unprocessed

Unprocessed pseudogenes appear to be copies of active genes. The most common examples are alpha-globin and beta-globin pseudogenes. These unprocessed or duplicated pseudogenes are often found in clusters near similar, but functional, genes on the same chromosome (Brown et al., 1996).

This pseudogene type usually contains the same introns and flanking regulatory sequences as do functional genes (Doolittle, 1993). Expression of these pseudogenes is assumed to be prevented by the lack of transcription initiation sequences or premature stop codons that result in truncated proteins during translation. Another difference that also may exist between unprocessed pseudogenes and functional genes is that the former contains many putative point mutations, deletions, and insertions (Thiele et al., 2003).

Processed

Processed or retrotransposed pseudogenes may be another source of pseudogenes (Jackers et al., 1996). They are believed to result from a reverse transcription of processed mRNA, which results from retrotransposition followed by an insertion of the copy DNA somewhere else into the genome (Fairbanks and Maughan, 2006). Retrotransposons are products of transcription (i.e., RNA) that then serve as the template for production of DNA. These DNA sequences are then reintegrated into genomic DNA, thus resulting in a duplicated gene.

These so-called processed pseudogenes are commonly found on chromosome locations that are different from their functional counterparts.

Transcripts of DNA, called messenger RNA (mRNA), carry the instructions for the protein synthesis machinery in the cell. The mRNA sequence consists of exons, which code for specific proteins. These exons are separated on the RNA strand by noncoding spacer sequences called *introns*. Processing of mRNA involves removing the intron sequences and splicing the exons together to form an edited mRNA copy (Kandul and Noor, 2009). This processed copy is then used for the translation of proteins. Some pseudogenes have introns that are removed after transcription, suggesting that they once were functional genes. It also suggests that they are still functional, even if that function is currently unknown.

Processed pseudogenes are believed to be produced after the mRNA is edited to remove the introns. The mRNA is then copied back into DNA by a reverse transcription process. The copy of mRNA, called copy DNA or cDNA, is then integrated back into the chromosome. A specific non-pseudogene example is the L-1 family of repetitive DNA sequences (Jurka, 1989). Why this processing occurs is still unknown, but if past experience is any guide, the existence of this complex process indicates these pseudogenes have an important function.

Processed pseudogenes can produce complete copies of a specific coding sequence and may also contain additional inserted sequences. However, these pseudogenes lack certain other sequences necessary for protein translation. Because processed pseudogenes are produced from processed mRNA, they lack introns and the necessary upstream regulatory sequences (those existing in front of the gene) required for genes to direct and control protein assembly.

Conversely, exceptions exist, but these altered pseudogenes often terminate in a series of adenines (a poly-A-tail), as do functional genes. Most of these pseudogenes are also flanked by direct repeats: structures associated with movable genetic elements. These elements may play a role in assisting the process of splicing pseudogenes into chromosomes (Gibson, 1994).

Pseudogenes in the Origins Debate

Pseudogenes are of major interest in the origins debate. Although they closely resemble functional genes, they have no assigned, known function. Darwinists have assumed this means they have no function. Therefore, as Dawkins concludes, this is evidence for evolution and against intelligent design. Miller (1994, p. 25) argues:

> Intelligent design cannot explain the presence of non-functional pseudogenes unless it is willing to allow that the designer made serious errors, wasting millions of bases of DNA on a blueprint full of junk and scribbles. Evolution, in contrast, can easily explain them as nothing more than failed experiments in a random process of gene duplication in a genome of evolutionary remnants.

In other words, an intelligent designer would not create an organism with a large number of useless parts, and these worthless genes are evidence that the genome was not designed. Hence, a creator did not play a role in the origin of the genome.

Evolutionists also argue that the origin of pseudogenes is largely a result of chance, the outworking of natural law, the contingencies of history, and the deficiencies of the entire genetic system. This view, however, is changing as a result of continuing discoveries within molecular biology and genetics. Some commentators conclude the molecular revolution has produced more scientific knowledge in the past three decades than has accumulated in science's entire history, and if this trend continues, our view of the genome will no doubt continue to be revolutionized (Willingham and Gingeras, 2006).

In addition, some Darwinists also argue that beside duplicated genes, pseudogenes also provide an additional mechanism for evolutionary change. They argue that pseudogenes could allow for the existence of nonlethal mutations because the pseudogene no longer serves a genetic role in the organism. This permits the pseudogene to accumulate mutations that will not be deleterious to the organism. Thus, these mutations could evolve the pseudogene into a new functional gene that would confer a survival advantage to the organism. In other words, these Darwinists argue that mutated pseudogenes would *not* be lethal because the psuedogene is not necessary for life, but selection would favor it if enough mutations occurred so that the gene could become beneficial. In this way pseudogenes could evolve to become useful genes.

However, true pseudogenes cannot be selected for by natural selection because by definition they lack a selectable function. For the psuedogene to be selected, other mutations also must occur to cause the former psuedogene to be translated and obtain selectable activity (e.g., transcription/translation). If a gene can be translated, it is not a pseudogene and is assumed to have a function. A gene that cannot be transcribed will not be translated and will not undergo positive selection. So if a pseudogene evolved that was useful in the organism, it must also evolve the appropriate control sequences required for regulation and proper function. It could not undergo positive selection until all of the required proper control sequences first existed. If a new beneficial gene was able to acquire the control mechanisms to restore function, as evolutionists assume, so could a myriad of currently harmful genes.

Another problem with the evolutionary interpretation of pseudogenes is that many genes are pleiotropic (meaning the gene produces proteins that affect more than one function in the cell—see Bergman, 2010). Changing one gene will, consequently, affect other proteins and functions in the cell. In addition, most biological structures and biochemical systems, such as blood clotting, require many genes and thus are polytrophic, meaning all of the necessary parts must exist in a highly integrated functional set in order for the system to work (Behe, 1996). Thus, whether pleiotropic or polytrophic, single genes have interacting effects on the organism's phenotype. This interaction makes pseudogene evolution far more complicated than the mere reactivation by a few key mutations.

Pseudogene Patterns in Life

Researchers have found that unprocessed pseudogenes exist in a wide variety of organisms. When genes for equivalent proteins are compared in different species, the coding sequences often differ in both expected and unexpected ways. Likewise, the more taxonomically similar the two species are, often the more similar are their pseudogene DNA sequences. This is true in general and for specific enzymes, although some major exceptions exist in spite of this overall pattern. Another argument for their function is the fact that

> Pseudogenes are pervasive, and usually abundant, in all eukaryotic organisms … In human, about 12,000 DNA sequences show evidence of pseudogenes … comparative analysis of processed pseudogenes in the mouse and human genomes has surprisingly demonstrated that 60% of the processed pseudogenes are conserved in both mammalian species. The high abundance and conservation of the pseudogenes in a variety of species indicate that selective pressures preserve these genetic elements, and suggest that they may indeed perform important biological functions (Wen et al., 2012, p. 27).

Gene conservation is one of the strongest arguments for their function. If they were nonfunctional, mutations would accumulate, and they would not be conserved in the genome.

Comparisons of DNA sequences from primates, including humans and chimps, reveal a considerable number of pseudogenes that are very similar both in their sequence and positional relationship to other genes. The best-known example is the *eta-globin* gene, which is part of the β-like globin gene family. Eta-globin is classified as a pseudogene because it has no known start codon and several stop codons.

Evolutionists attempt to explain the sequence similarities of both genes and pseudogenes as a result of their inheritance from a common ancestor. The often-minor differences are attributed to the accumulation of mutations that have occurred since the species diverged from their hypothetical common ancestor. Conversely, creation explains the sequence similarities due to common designs required because they serve similar functions. Chimps, gorillas, and humans all have the exact same number of beta-globin genes, and they are arranged on the chromosome in the same order, a similarity that is a strong indication of functionality (Lalley et al., 1989).

Sometimes overlooked in the evolutionist's conclusions is the fact that the function of only a small number of proteins is fully understood, and sequence differences in many cases could reflect primarily differences required for the proteins to function properly in the various biological environments existing in different life-forms. The differences also could be the result of the regulatory needs of different animals. Likewise, pseudogenes would be logically similar if they have functions that constrain variation. The similarity of life is especially strong at the cellular level—the basic, undifferentiated eukaryotic cell found in all animal life is almost identical. Too much variation could cause malfunction, resulting in disease or even death.

Similarity Indicates Function

The fact that many pseudogenes are highly conserved (similar in both so-called primitive and advanced life-forms)—and many are very similar in humans and other organisms—supports the conclusion that most of them have a function. It also supports the conclusion that the genome is a complex, organized, designed system and not a haphazard accumulation of genes that originally formed as a result of mutations in an ancestral life form and then were inherited largely unchanged for eons down to our generation.

Similar pseudogene sequences in two related animals are considered to be orthologous, having originated from a common ancestor (Woodmorappe, 2000, Gibson, 1994, p. 91). This similarity in different animals is used by both Darwinists and creationists to argue that pseudogenes have a function. The fact that pseudogenes "exhibit evolutionary conservation of gene sequence, reduced nucleotide variability, excess synonymous over nonsynonymous nucleotide polymorphism, and other features that are expected in genes or DNA sequences that have functional roles" is evidence that they have one or more functional roles in the organism (Balakirev and Ayala, 2003, p. 123).

The question of pseudogene function is inextricably tied up with the role of all noncoding DNA, including introns, satellite DNA (highly repetitive short DNA sequences), and other repetitive sequences (Elder and Turner, 1995). Estimates of the amount of non-protein-coding DNA range from close to 5% for some bacteria, to 70% for some roundworms, to about 95% for humans (Gibson 1994, p. 104). Bacteria and viruses are said to have wall-to-wall genes. A significant fact is that, in general, the "higher" the life-form, the *greater* the percent of non-protein-coding DNA it has in its genome. The fact that more complex life-forms tend to have proportionally more noncoding DNA indicates that it has a function (Zheng and Gerstein, 2007), often being transcribed to regulatory microRNA (Djebali et al., 2012) or other regulatory features (Birney, 2012). The ENCODE project has documented several levels of function in many pseudogenes (Birney, 2012), including transcription, contradicting the once common conclusion that

> most pseudogenes lost transcribed activity either due to their integration into the silent region of the genome or due to mutation of the promoter or auxiliary regulatory elements. However, recent increasing evidence has demonstrated that pseudogenes represent a significant proportion of the "transcriptome" in various organisms … Evidence of expression of pseudogenes has been demonstrated not only in animals but also in plants (Wen et al., 2012, pp. 28–29).

Useless Gene Hypothesis

The useless gene hypothesis is critical for evolutionary assumptions about pseudogenes, but the theory tends to break down when the earlier putatively "less-evolved" organism stage is evaluated. For example, *Escherichia coli* sequence evaluations reveal wall-to-wall genes (4,253 genes and only 4.5 million base pairs of DNA). Humans have three billion base pairs and only about 23,000 genes (Mishra, 2010, p. 16). In bacteria, the ratio of protein-coding genes to base pairs of DNA is 1 to 1,050; in humans it is 1 to 100,000, a 95-times greater level (Zheng and Gerstein, 2007, p. 220).

If we were to assume that most pseudogenes are functionless, our understanding of genetics indicates that we would not expect that they would arise by the process of gene duplication gone awry. One reason this is evidence of deterioration, not evolutionary progress, is the fact that repetitive DNA (such as triplet repeat expansion disorders) is often associated with diseases such as Huntington's disease.

The function of many of the repetitive classes of non-protein-coding DNA is now understood. For example, one set of moderately repeated DNA codes is now known to code for transfer RNA and ribosome RNA (Zubay, 1995 p. 641). The genes that code for the five different histone types are usually clustered together on the genome, and this cluster forms a tandemly repeated array containing up to one hundred copies. Similarly, even globin and immunoglobulin genes are arranged as tandemly repeated arrays. These discoveries have reduced the amount of alleged junk DNA. In short, if

> pseudogenes are dysfunctional, why are they so highly expressed? Two possibilities may explain it. One possible explanation is that these pseudogenes are only incidental byproducts in the transcription events of other genes, because they are under the effect of the same promoters. An alternative explanation, which we are more inclined to accept, is that the pseudogene transcripts are in fact functional but not random products. More and more accumulating examples support this alternative explanation (Wen et al., 2012, p. 29).

Some Known Functions

As DNA research has progressed, functions for noncoding DNA have gradually been determined, and evidence that some or even most pseudogenes are functional has accumulated (Wen et al., 2012). Unprocessed pseudogenes are usually found on the same chromosome in clusters near similar but functional sequences, indicating both order and function. A major factor influencing this view is the discovery that, although the control system is generally just upstream of the coding exons, more and more exceptions are now known (Willingham and Gingeras, 2006).

Gene control is now recognized as enormously complex, and the distribution of regulation factors in the genome is so widespread that the gene concept, as a discrete region of DNA, has now been rejected (Pearson, 2006). As Balakirev and Ayala (2003, p. 123) conclude, "Pseudogenes that have been suitably investigated often exhibit functional roles, such as gene expression, gene regulation, and generation of genetic (antibody, antigenic, and other) diversity."

The observation that some genes that were once classified as pseudogenes have now been determined to have a function indicates that many more may be functional. An example is the chicken calmodulin gene, once considered nonfunctional but now known to have a function (Adams et al., 1992; Ohya and Yasuhiro, 1989). Some pseudogenes are transcribed but not translated, indicating a function for the transcript other than making protein. Studies of mouse pseudogenes indicate as many as 50% can be transcribed (Zheng and Gerstein, 2007). Tam et al., (2008, p. 534) found a subset of pseudogenes that generate endogenous, small interfering RNAs (endo-siRNAs), which

> are often processed from double-stranded RNAs formed by hybridization of spliced transcripts from protein-coding genes to antisense transcripts from homologous pseudogenes. An inverted repeat pseudogene can also generate abundant small RNAs directly. A second class of endo-siRNAs may enforce repression of mobile genetic elements, acting together with Piwi-interacting RNAs.

Furthermore, whole classes of small RNAs are used for regulation by blocking the translation of mRNA, and some may originate from pseudogenes (Guo et al., 2009).

Another possible potential function of pseudogenes is to bond to active genes during DNA replication to help stabilize the DNA. Some pseudogenes are involved in gene conversions or in recombination with functional genes to produce more mRNA transcript variations; a design used in order to create protein variations (Balakirev and Ayala, 2003). Willingham and Gingeras (2006, p. 1215) concluded the "widespread occurrence of noncoding RNAs—unannotated eukaryotic transcripts with reduced protein coding potential—suggests that they are functionally important." Some pseudogenes serve as "reservoirs of genetic variability," and this discovery has opened up a whole new area of research that may help to explain the enormous variety of life existing in the living world.

Pseudogenes are also postulated to have many other functions, including assisting active genes, gene silencing, and regulating development (Zheng and Gerstein, 2007). Much of this research is still ongoing, and the results are still very tentative. For example, evidence that pseudogenes may have a specific and important gene regulatory role has been derived from several studies. Further research, though, has questioned the findings of at least one study, that by Hirotsune et al., (2003) discussed below.

The Hirotsune Study

In 2003, evidence that a mouse pseudogene had regulatory role in development was reported. Hirotsune et al. (2003) obtained a line of transgenic mice that died soon after birth because of multiple organ failure. Subsequent investigations concluded that transcription of the *Mkrn1-ps1* pseudogene was disrupted in these mice by an insertion of the *sex-lethal* gene. In wild-type mice, *Mkrn1-ps1* pseudo-RNA was believed to be essential for the stability of a mRNA isoform produced from the parental gene makorin 1. The proposed function of *Mkrn1-ps1* was also supported by the finding that abnormal development of the transgenic mice could be reduced by *Mkrn1-ps1* or Mkrn1 by overexpression. The evidence was sufficiently compelling that the researchers concluded they had identified a functional mammalian pseudogene.

However, in a follow-up study, Gray et al. (2006) found evidence that *Mkrn1-ps1* was *not* transcribed and the transcript originally attributed to *Mkrn1-ps1* was an overlooked mRNA isoform at the *Mkrn1* locus. Furthermore, in the samples studied, it was found that the 5'-regions of both *Mkrn1-ps1* alleles were fully methylated, also indicating this pseudogene was likely not transcribed. These "contradictory results underscore the difficulty in evaluating the functional status of a pseudogene" (Zheng and Gerstein, 2007, p. 220).

Because a large number of proteins in a cell interact, either the interaction must be functional or at least the proteins cannot impede the roles of other proteins and cause adverse reactions. Consequently, a change in one protein often requires a change in a great number of other proteins. This is necessary to ensure that each protein's interactions with other proteins either has neutral or beneficial effects on the cell. Likewise, it now appears that some or many pseudogenes have a function that requires compatibility with the rest of the organism (Woodmorappe, 2000, 2003a, 2003b, 2003c). For this reason Zheng and Gerstein (2007) conclude that the boundary between pseudogenes and other genes is rather ambiguous.

Sometimes a functional mRNA is produced from what was assumed to be a pseudogene. This assumption is based up the presence of start codons that are either cryptic or located at a considerable distance from the gene's open reading frame. The extra stop codons in many pseudogenes may function as regulation elements that are selectively removed to allow for variation in the gene's expression. One study of a pseudogene found transcription begins after a stop codon, the new reading frame assumed to result from a reading frame formed by a frame shift mutation, which removed the stop codon. This new reading frame coded for a functional protein receptor (Balakirev and Ayala, 2003, p. 124).

Some pseudogenes could be functional genes that in humans were deactivated for reasons such as regulation or the result of a mutation. Thus,

> Pseudogenes may recover the full original function of the genes from which they derive. Pseudogene function has been restored in vitro by mutagenesis transfection, or in vivo by site-specific (or intermolecular) recombination (Balakirev and Ayala, 2003, p. 137).

When we learn more details of the role each gene has in a cell, or at least the function of the protein they encode, we will more readily ascertain what DNA sequences, if any, are in fact functionless. Only when the entire DNA genome is fully analyzed will it be possible to determine the percentage (if any) of DNA that is actually noncoding or lacks a function. As Balakirev and Ayala (2003, p. 137) write,

> How pervasive are "functional" pseudogenes? Many pseudogenes have been identified in all sorts of organisms on the grounds that they are duplicated genes that exhibit stop codons or other disabling mutations in their DNA sequences, so that they cannot have the full function of the original genes from which they derived. In many of these cases, however, it remains unknown, because it has not been investigated, whether the pseudogenes, described only on the basis of DNA sequences, may have acquired regulatory or other functions, or play a role in generating generic variability.

There are now indications that much DNA does not have a coding function, but most all of it has other roles in the cell. Although the function of all human DNA is not yet known, it is clear that

> there is no evidence for significant stretches of DNA with no function. Frequently, genes with related functions are clustered. These clustered genes are usually transcribed into single expression units (messenger RNA's) containing the information for the synthesis of several functionally related proteins (Zubay, 1995, p. 642).

This same pattern of gene clustering also exists in the most "primitive" bacteria known (Zubay, 1995 p. 642. See also the ENCODE research, such as Djebali et al., 2012).

Because geneticists have not yet discovered a use for many pseudogenes does not prove that none exists. It simply shows that we do not yet know the function of many DNA transcripts. Behe concluded that evolutionists claiming pseudogenes have been proven to be useless are not able to cite scientific literature for support of this claim because evidence for this view "is nowhere to be found" (Behe, 1996, p. 26). As Mounsey et al. (2002, p. 770) noted, "proving that a gene is totally nonfunctional, and is therefore definitely a pseudogene, is impossible." Balakirev and Ayala (2003, p. 137) concluded that "some functionality [of pseudogenes] has been discovered in all cases, or nearly, whenever this possibility has been pursued with suitable investigations." Pink et al. (2011, p. 792) adds that, although

> some pseudogenes are transcriptionally silent, others are active, raising the question of whether their noncoding transcripts are a spurious use of cellular energy or instead harnessed by the cell to regulate coding genes. This question is particularly pertinent given the recent flurry of evidence suggesting that long noncoding RNAs play a critical role in regulating genomic function.

This observation may explain the fact that some putative pseudogenes are named after the functional gene they resemble. For example, the 4,846 bp pseudogene named the CEL-like gene (CELL) has a "striking homology" to the CEL gene, except the CELL pseudogene lacks exons 2–7 found in the CEL gene (Lidberg et al., 1992, p. 630). This putative pseudogene, as well as many other presumed pseudogenes, is transcripted. Thus, these examples challenge the original pseudogene definition that they are damaged genes. Rather, experimental verification suggests that such a definition seems to apply to only a "tiny proportion of the large number of pseudogenes present in a variety of genomes" (Zheng and Gerstein, 2007, p. 219). Some putative pseudogenes are linked together, which also suggests that they have a function (Lamerdin et al., 1996; Schutte et al., 2000; Savelyeva et al., 1998).

The fact that some pseudogenes are selectively transcribed indicates that they were misnamed and should be reclassified (Zheng and Gerstein, 2007). In short "the list of DNA sequences that have no effect on the organism has steadily decreased as knowledge of the operation of the genome has increased" (Gibson, 1994, p. 104; also see Djebali et al., 2012). This research is critical, for example, because of the evidence that pseudogenes are important in cancer causation, and it

> has been shown that pseudogenes are capable of regulating tumor suppressors and oncogenes by acting as microRNA decoys. The finding that pseudogenes are often deregulated during cancer progression warrants further investigation into the true extent of pseudogene function. In this review, we describe the ways in which pseudogenes exert their effect on coding genes and explore the role of pseudogenes in the increasingly complex web of noncoding RNA that contributes to normal cellular regulation (Pink et al., 2011, p. 792).

Pseudogenes as Evidence of Dysgenetics

Some of the differences found in both genes and pseudogenes can be explained as the accumulation of mutations that have occurred since Creation (Woodmorappe, 2004). The creationist view postulates that the original created organism was mutation-free, and its once-perfect genomic system has since degenerated, leading to some useless DNA sequences and numerous imperfect copies of genes. Mechanisms that could create pseudogenes include mutations, unequal crossing over that disrupts functional DNA sequences, and inappropriate transposition.

For this reason the existence of nonfunctional pseudogenes does not disprove design of the original genome. At most, it proves that some designed genes were corrupted as a result of mutations or mistakes in some genetic processes. Mistakes in gene copying commonly occur, and although the vast majority are corrected, some well-documented examples of non-corrected genes exist in the medical literature (Jorde et al., 1997). Up to two-fifths of all pregnancies now result in miscarriages, often because of DNA damage; a problem that indicates human DNA is now enormously corrupt compared to the original creation (e.g., see Meisenberg and Simmons, 2006, p. 153). Evidence that some pseudogenes are damaged genes also includes their involvement in disease.

Ultimately, some pseudogenes may no longer have a function due to genome deterioration. Evolution cannot explain how or why these pseudogenes (and the entire genome) originally evolved. In contrast, the Creation model explains that these genes were originally created with functions, but have subsequently lost these functions as genomic degeneration occurred following the Fall and the Curse (Genesis 3). In order for damaged genes, such as pseudogenes, to become functional (as proposed by some evolutionists), many complex proteins that are compatible with the pseudogene are required to have evolved also. These include helicases and other proteins that pry apart the two DNA strands and align the transcription machinery at the proper location, and enzymes that stitch the nucleotides together into the appropriate polymer. Proteins are needed to strengthen the polymer (single-stranded binding proteins), and other proteins are required to insert the pseudogene copy back into the DNA (Adams et al., 1998).

A Creationist Perspective

The close similarity of putative damage in pseudogenes in different life-forms called "shared mistakes" is used to argue for evolution based on the analogy that identical typo errors or other mistakes in printed texts argue for plagiarism. Thus, identical putative errors in genes argues for a mistake in the postulated common ancestor that was passed down to its progeny (Woodmorappe, 2004). In support of this view, Dawkins (2009, p. 336) wrote that the "very existence of pseudogenes—useless, untranscribed genes that bear a marked resemblance to useful genes—is a perfect example of the way animals and plants have their history written all over them."

Neo-Darwinists argue that "God would not create similar non-functional sequences in humans" and other animals, such as chimps; thus, a common ancestor is the better explanation (Gibson, 1994, p. 91). Aside from the difficulty of judging what God would do, a mutation in a similar pseudogene may be in the same location in two animals for many reasons, such as it is actually functional or because a similar genetic mutation occurred due to the presence of a mutational *hot spot* (i.e., site of frequent mutations) at that location (Andersson and Andersson, 2001).

Many pseudogenes, such as those that lack promoters or contain evidence of a frame shift or nonsense mutations or loss of splice sites, do appear to be evidence of genetic degeneration. The latter explanation conforms to the Genesis Fall causing degeneration, not the Darwinian progression view. Deterioration is a prediction of the Creation model, while evolutionary advancement is a prediction of neo-Darwinism (Wilaims, 1981, pp. 114–119). As Zheng and Gerstein (2007, p. 219) note, the discovery that some pseudogenes are functional raises questions:

> How should the concept of 'nonfunctional' be interpreted in defining pseudogenes? How could this finding be amalgamated with the established evolutionary theory, which often uses pseudogenes as nonfunctional and neutrally evolving DNAs for estimating various parameters in evolution. The scientific community, especially those dealing with molecular evolution and gene or pseudogene annotation, began to ponder these questions.

Possible functions for pseudogenes are reported almost monthly (Pink et al., 2011; Hernández, et al., 1998; Baertsch et al., 2008; Cooper and Kehrer-Sawatzki, 2008; Jegga and Aronow, 2008). The title of a recent article on this topic "Pseudogenes Are Not Pseudo Any More" is a good summary of the current state of the research (Wen et al., 2012, p, 27).

Conclusions

Arguing for evolutionary naturalism on the basis of DNA sequences that do not have a known function is an argument from ignorance (Balakirev and Ayala, 2003). Now that we know many pseudogenes are transcribed and have been determined to have a function, the most that can be concluded is that the function of many pseudogenes is currently unknown. As the history of the neo-Darwinism vestigial organ argument has documented, it was difficult to determine the uses of many structures until more knowledge about anatomy and physiology was gained (Bergman and Howe, 1990).

Until the entire human genome has been carefully and fully studied (a feat that may still be decades from completion), it is premature at this early stage of genome research to conclude that any gene or structure is completely without function (Zheng and Gerstein, 2007). Pseudogenes that have been carefully

> investigated often exhibit functional roles, such as gene expression, gene regulation, generation of genetic (antibody, antigenic, and other) diversity. Pseudogenes are involved in gene conversion or recombination with functional genes. Pseudogenes exhibit evolutionary conservation of gene sequence, reduced nucleotide variability, excess synonymous over nonsynonymous nucleotide polymorphism, and other features that are expected in genes or DNA sequences that have functional roles (Balakirev and Ayala, 2003, p. 123).

As a result, the following conclusion has now been supported by the evidence.

> Pseudogenes have long been labeled as "junk" DNA, failed copies of genes that arise during the evolution of genomes. However, recent results are challenging this moniker; indeed, some pseudogenes appear to harbor the potential to regulate their protein-coding cousins. Far from being silent relics, many pseudogenes are transcribed into RNA, some exhibiting a tissue-specific pattern of activation. Pseudogene transcripts can be processed into short interfering RNAs that regulate coding genes through the RNAi pathway (Pink et al., 2011, p. 792).

The latest conclusion is that the

> published evidence has shown that pseudogenes are not only transcribed, but also post-transcriptionally modulate their cognate genes by three distinct mechanisms: (1) natural antisense RNA suppression; (2) RNA interference by producing

> siRNAs; and (3) acting as decoys of stabilizing or disabling/inhibiting factors (Wen et al., 2012, p. 29).

Only when the various functions of each gene are fully understood can viable conclusions about uselessness be hypothesized. Even then, "proving that a gene unit is totally nonfunctional, and therefore definitely a pseudogene, is impossible" (Mounsey et al., 2002, p. 772). The discovery that some sequences labeled pseudogenes do perform genetic functions justifies the assumption that many, if not most, pseudogenes may eventually be found to have a function. Current research continues to support this conclusion. As Zheng and Gerstein (2007, p. 222) concluded, the "diverse ways that a genome sequence can realize its biological function have made it difficult to define a nonfunctional sequence."

The evolutionary view, involving mutational and natural selection, predicts a mechanism that facilitates, or at least allows, the evolution of the genome. This would involve transformation from one hypothetical pregene to the millions of different genes existing in the living world by known, plausible, naturalistic processes. This evolutionary idea would include a naturalistic means of producing new genes that are functional, and yet not detrimental, to allow some of these genes to confer a survival advantage to the organism.

As more and more animal and plant genomes are sequenced and analyzed, it is becoming increasingly clear that the design view fits the data much better. It is "clear that a whole genome is less like a static library of information than an active computer operating system for a living thing" (Gerstein and Zheng, 2006, p. 49). A design view predicts the entire genome was originally functional and that it is dominated by information, stability, design, purpose, and order, but has degraded somewhat over time (Williams, 1981). This complex system is evidence for order, design, and purpose for most pseudogenes, even in their present, post-Fall condition (Pitman, 2012). It is now recognized that

> the study of functional pseudogenes is just at the beginning. There remain many questions to be addressed, such as the regulatory elements controlling the cell or tissue specific expression of pseudogenes. But, definitely, the so-called pseudogenes are really functional, not to be considered any more as just "junk" or "fossil" DNA. Surely many functional pseudogenes and novel regulatory mechanisms remain to be discovered and explored in diverse organisms (Wen et al., 2012, p. 31).

The research so far has falsified Dawkins's boast that pseudogenes are useful only for embarrassing creationists. We do not need to stretch our "creative ingenuity to make up a convincing reason why an intelligent designer should have created a pseudogene," as Dawkins claims. We need only to understand the current scientific literature, and continue to increase our understanding of the genome and how it functions.

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Letters to the Editor

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Critics of RATE Overlook Its Results

Editor:

In their critique of the creationist research initiative, Radioisotopes and the Age of the Earth (RATE) (Vardiman, et al., 2000, 2005) and Carl Froede and Jerry Akridge (2012) appear to be skeptical of the project's conclusions, though they never say so explicitly. Yet they also appear to overlook crucial results of the project. First of these is the massive evidence for much nuclear decay having occurred throughout the earth—billions of years' worth *if* decay rates were always as slow as they are today. In contrast, RATE's main hypothesis, accelerated decay, is that nuclear decay rates were much higher during short episodes in the past, such as during early Creation Week and the year of the Genesis Flood.

Evidence for Much Nuclear Decay

In my RATE study of the feasibility of accelerated decay, I gave an overview of a century of evidence for much nuclear decay (Humphreys, 2000, pp. 335–337). Additionally, the RATE project gathered and analyzed data from all the major categories of such evidence.

1. Mother and daughter isotopes together. All over the world, small crystals of various minerals contain both radioactive atoms and also large amounts of the specific type of atoms that result from their decay. In many cases it is very difficult for these atoms to either leave or enter the crystals, and sometimes at the outset there are very few of the daughter atoms in the crystals.

Zircon, a common mineral in the earth's granitic crust, is particularly instructive (Humphreys, 2012). We know from both experiment and basic geochemistry that as crystals of zircon form in cooling magma, they chemically attract uranium atoms and incorporate them into their crystal lattice in place of zirconium atoms. Yet at the same time, they chemically reject lead, as we know from both experiment and geochemistry. So when zircons finish crystallizing, they contain a relatively large number of the most common type of uranium atom, ^{238}U. More important, they also start out with almost *none* of the ultimate descendant of ^{238}U decay, atoms of lead 206 (^{206}Pb).

Yet it is very common to find not only much ^{238}U in zircons, but also large amounts of ^{206}Pb— often *billions of years'* worth. RATE found 1.4 billion years' worth of ^{206}Pb in deep Precambrian zircons (Humphreys, 2005, p. 76, note under Table A1). Since zircons are very hard, refractory, dense, tightly packed crystals, it is very difficult for uranium and lead to enter or leave the crystals once they have formed. For those elements, zircons are nearly the ideal closed system everybody likes to study. It is very difficult to avoid the conclusion that most of the lead in zircons came from nuclear decay—lots of it.

Last, a century of research has shown that wherever large concentrations of ^{238}U are, whether in crystals or ore deposits, there are also many millions of years' worth of the main fourteen isotopes in its decay chain: ^{234}Th, ^{234}Pa, ^{234}U, ^{230}Th, ^{226}Ra, ^{222}Rn, ^{218}Po, ^{214}Pb, ^{214}Bi, ^{214}Po, ^{210}Pb, ^{210}Bi, ^{210}Po, and finally ^{206}Pb. There are also small amounts of minor daughter isotopes: ^{218}At, ^{210}Tl, and ^{206}Tl. It strains credulity to try to imagine non-nuclear ways those specific isotopes would occur exactly where uranium concentrations are high.

2. Radiohalos. RATE researchers Andrew Snelling and Mark Armitage (Snelling, 2005a) studied thousands of such halos from many different geologic settings. Fully-formed eight-ringed ^{238}U halos, the "scars" of alpha-particle decay, are very common. Yet at today's decay rates, it would take *hundreds of millions of years* to produce enough alpha particles to fully form such halos. Ion microscope studies of the centers of the halos, micron-sized zircons, show that they contain not only ^{238}U, but also the final product of decay from that isotope, ^{206}Pb.

3. Helium together with uranium. All of the naturally occurring decay chains, two of uranium and one of thorium, produce helium 4. The nuclei of the ^{4}He atoms are the very same alpha particles emitted by nuclei as they decay. ^{238}U emits eight alpha particles as it decays to ^{206}Pb. My RATE project studied zircons large enough to have retained much of the helium (Humphreys, 2005). The coolest of the zircons appear to have retained about 80% of the helium deposited in them during the 1.5 billion years' worth of uranium decay that produced the ^{206}Pb in them. So the experiments RATE sponsored registered over *one billion years'* worth of the actual alpha particles emitted during the nuclear decay.

4. Fission tracks. RATE found that these straight, microscopic "scars" produced by uranium fission are abundant enough in deep strata in the Grand Canyon-Colorado Plateau region to require *tens to hundreds of millions of years*' worth of decay to produce them

(Snelling, 2005b). In fact, the amount of fission tracks in the Cambrian, Jurassic, and Miocene tuffs studied "were found to exactly equate to the quantities of nuclear decay measured by radioisotope age determinations of these same rocks." These results were the final bit of evidence that convinced skeptics on the RATE committee itself that many millions of years' worth of nuclear decay occurred during the year of the Genesis Flood.

5. Heat from nuclear decay. The particles from nuclear decay in the earth heat the surrounding rock. The heat then travels slowly away. Geoscientists have long known that where rocks are more radioactive, there is more heat right there (Humphreys, 2000, p. 337). It is a paradox to them, because after billions of years, the heat should have traveled much further. RATE geophysicist John Baumgardner explained this very neatly by assuming there was a burst of heat generated by accelerated decay only thousands of years ago (Baumgardner, 2000, pp. 80–86).

I summarized these phenomena in my feasibility study (Humphreys, 2000, p.337):

> Thus we observe a wide spectrum of nuclear decay effects: (1) daughter isotopes along the whole decay chain, (2) visible scars (halos) from α-decay, (3) the α-particles themselves (He nuclei), (4) visible tracks from decay by fission, and (5) the heat produced by nuclear decay. The most reasonable hypothesis is that all these products of nuclear decay were indeed produced by nuclear decay! But the amounts of those products we observe are much greater than thousands of years could produce—at today's rates.

No Escape from Accelerated Decay

Froede and Akridge commendably believe that the earth is only thousands of years old. But if they are logical and pay attention to the above evidence, then they cannot escape the conclusion that accelerated nuclear decay has indeed occurred in the earth's recent past. Nobody, including them, has been able to suggest a reasonable alternative scenario that can explain the above evidence within a young-earth framework.

Not only that, but it is also impossible to escape the conclusion that some phenomenon disposed of most of the heat that would usually be generated by the accelerated decay. Otherwise, the earth's crust would have been vaporized several times over. That is why some kind of "volume cooling"—an unusual transport mechanism (not conduction, convection, or radiation) of heat rapidly out of large volumes of rock away from the earth entirely—is a necessary corollary of accelerated nuclear decay. Today I call the mechanism *accelerated cooling*.

Observation Trumps Theory

Froede and Akridge say that creationists should not accept accelerated decay or accelerated cooling because nobody has yet produced a complete theoretical explanation of them. That's as if Pope Urban had told Galileo he would not believe the latter's observation that all bodies fall with the same acceleration—simply because somebody like Newton had not yet come along with a theory to explain it. In the same way, we have numerous lines of evidence that accelerated decay and accelerated cooling happened, whether we can explain them or not—and whether we like them or not.

Nevertheless, by now we understand a little about accelerated decay. Eugene Chaffin's work shows that a modest weakening of the strong nuclear force would greatly increase the rate of alpha decay (Chaffin, 2005, pp. 527–533). Also, he has shown that such a weakening of the strong force would affect the distribution of energy levels in the nucleus in such a way as to change the rate of beta decays. Long-lived beta decays, like that of ^{40}K, would be speeded up far more than short-lived beta decays, like that of ^{14}C (Chaffin, 2005, pp. 563–567). Not many people have noticed these explanations, apparently including Froede and Akridge, probably because nuclear theory can be daunting. But Chaffin sufficiently answers the question proposed by Froede and Akridge as to why slow decays were accelerated more than fast-decaying ^{14}C.

We also understand a little about accelerated cooling. I proposed that the same (accepted) general relativistic mechanism that decreases the kinetic energy of photons moving through an expanding space also decreases the kinetic energy (i.e., heat) of atoms in solids here on earth (Humphreys, 2005, pp. 67–74). Such a decrease would be undetectable today at today's slow rate of cosmic expansion as measured by clocks here on earth. But since we have scriptural and scientific reasons to believe that time dilation may have greatly slowed clocks here on earth during the episodes of nuclear decay acceleration (during early Creation Week and during the Genesis Flood), then the expansion of space during those episodes would be very fast as measured by earth's clocks (Humphreys, 2005, p. 73). That would accelerate this "cosmic expansion" cooling greatly in solids here on earth.

Froede and Akridge quote that section of my chapter, but they seem to have no understanding of my proposed mechanism. In saying they want "empirical evidence of rapid-to-instantaneous crustal cooling," they don't seem to recall their own quotation just a few paragraphs earlier of me citing several items of such empirical evidence. The items are: (1) the rapid cooling of radiohalos (Snelling and Armitage, 2003, p. 260.) and (2) removal of much heat from concentrations of radioactivity (Baumgardner, 2000, p. 86).

I expect there will be more theoretical work and observational evidence supporting accelerated decay and accelerated cooling. Except for people resisting (or clinging to) a Flood model supported by (or rejected by) the RATE results, the theory and evidence we already have should be satisfactory.

Failure to Understand Dating Methods

Froede and Akridge imply that they are among those who "remain skeptical of radiometric dating methods/results." Yet they seem unaware of important features of those methods. For example they are uncertain about evidence for much nuclear decay "because we do not know the original levels of radioisotopes in the various earth materials." They do not seem to realize that is not a problem in dating *zircons* (see item 1 in the list above) and that it is not a serious problem for *isochron* dating (DeYoung, 2000, pp. 41–42). One of the latter methods, *mineral isochron* dating, is very resistant to problems with initial amounts and outside influences (Austin, 2005). Froede and Akridge also don't seem to know that only for relatively recent rocks (such as post-flood basalts) are initial amounts a significant problem with the (old and not-so-good) *model age* method (Austin, 2000). In that case the lack of much decay makes the method particularly susceptible to assumptions about initial amounts of a daughter isotope (such as ^{40}Ar).

Last, they apparently don't realize that even when data from good and bad methods are lumped together and selected for maximum deviation from the expected geologic age, a clear *trend* still emerges. Figure 1 shows such data. I plotted them (Humphreys, 2000, p. 342, Fig. 3) from data published by John Woodmorappe (1979). He selected them from secularly published long-half-life (not short half-life ^{14}C) radiometric ages, choosing them for the largest deviation from the uniformitarian-accepted stratigraphic ages. They used a variety of isotopes and methods, both good and bad. Not surprisingly, there are some huge deviations from the dashed line showing equality of the two types of age. But notice there is still a clear clustering of dates around a trend line that, if shown, would be somewhat below the dashed line.

There are two explanations for such a trend. First, it could be real, meaning that more nuclear decay occurred for rocks very deep in the fossil strata and less for rocks less deep. Second, it could be that the original data were scattered evenly all over the graph, and that researchers simply "cherry-picked" the points that were finally published to get more conformity to the trend they wanted. But now we know that was not the case. RATE commissioned secular labs to get over a thousand nuclear dates, without telling the labs what dates would be expected. We published all of the dates we got. For long-half-life isotopes,

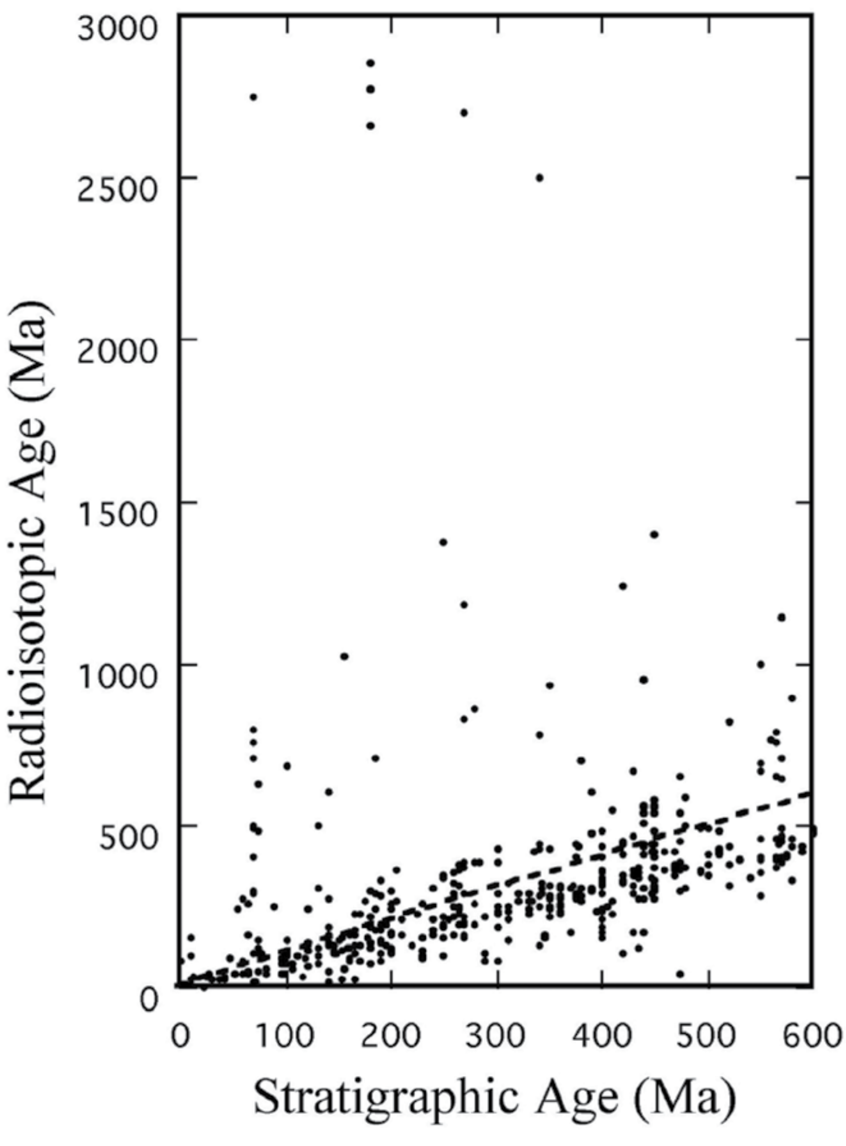

Figure 1. Published nuclear ages (not ^{14}C ages) compared to strata-determined geologic ages for the same rocks. Data picked for maximum deviation from the dashed line, where the data would lie if the two ages were always equal. Data also use a variety of methods (Woodmorappe, 1979).

not one of the dates using isochron methods gave the huge discrepancies Figure 1 shows. They were all relatively close to the trend line. So the trend is not "cherry-picked." It is real. That points to accelerated decay.

On the other hand, carbon 14 dates for fossils did show huge discrepancies. By the usual assumptions (incorrect for older dates) used for ^{14}C interpretation, the dates were tens of thousands of years, not millions to hundreds of millions of years. There was no trend with depth in the fossil layers; top, middle, and bottom of the strata gave the same average ^{14}C ages. That is consistent with little decay acceleration for carbon 14 (as Eugene Chaffin explained, see previous section), and with all the fossil layers being laid down in a very short time only thousands of years ago, as we would expect from the scriptural account of the Genesis Flood.

Using isochron methods on single rocks or formations, RATE did notice consistent differences between ages using different isotopes (Austin, 2005, p. 384; Snelling 2005c, pp. 433–434). Beta-decay methods gave younger ages than alpha-decay methods, and lighter nuclei appeared to give younger ages than heavier nuclei. Contrary to Froede and Akridge, these differences are not an indication of unreliability. Instead, they are to be expected from the theoretical work of Eugene Chaffin. They are evidence not only that accelerated decay occurred but also that different types of nuclei experienced different degrees of acceleration.

RATE Very Useful to Creationists

Froede and Akridge say that accelerated decay "seems to provide no practical use for young-earth creationists." On the contrary, it should be of great practical use to those who can accept it. First, it provides a rational explanation—so far, the only one—for the mass of evidence demanding that billions of years' worth of nuclear decay have occurred within the last six millennia. Knowing that gives confidence in understanding radioisotope data and applying them to understanding the history of the earth as recorded in the Bible.

Second, it gives a way to get *relative* dates for different rock formations. Make the reasonable assumption (based on both theory and evidence) that at any given instant, decay rates were the same throughout the earth. Then just use the same isochron/isotope method on the formations, and see which dates are younger/older than others. Identical dates point to simultaneous events all over the world. John Baumgardner (2012) has done an excellent study of the "relative age" question.

Third, it offers real hope that we can correlate real time with "radiometric time." A first cut at that problem is to make a curve fit to the trend in Figure 1. Next is to assign dates during the year of the Flood according to your rough model of Flood events. Put "early Flood" on the right and "late Flood" on the left. The result would be a rough correlation between dates during the Flood and radiometric age. If the curve were approximately a straight line, its slope would meet the desire of Froede and Akridge for a "radiometric age-date conversion factor." In fact, an eyeball fit to the trend line gives about 450 million radiometric years per real year, or 1.25 million radiometric years per real day during the Flood.

I'd like to see someone apply a single specific isochron dating method to formations all over the earth at all depths in the fossil strata. Probably a careful search of the literature could yield such data, then the data could be plotted according to stratigraphic age and make a curve fit. The result would be a curve connecting that method's radiometric age to the stratigraphic age, thus connecting it to events during the Flood. That would be a very useful tool for creation geologists in unraveling what happened during the Flood. I encourage creationists to make use of the RATE results, rather than resist them.

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Authors' Response: Science, Theory, History, and Miracles

We are very appreciative of the time and effort that Dr. Russ Humphreys has taken in responding to our article questioning the Radioisotopes and Age of the Earth (RATE) study results (Froede and Akridge, 2012). Open discussion is how we should develop and refine our ideas in creation science. As scientists, we must differentiate between testable science, theory, history, and miracles; the last concept is excluded from the realm of naturalism. All of these points were covered in the original RATE study, but there appears to be some confusion over what the data prove, what the data suggest, and application of the miraculous. Outside of testable limits, researchers are confined to inference and speculation. Miracles are not testable science.

There are many details and intricacies involved in nuclear science that provide conflicting results when analyses are sought through radiometric dating. As a result, it is puzzling why this tool in naturalism is now viewed as necessary in defining Bible history. It was stated in the first RATE volume:

> It was recognized by the group that radioisotopes and the age of the earth were significant problems which must be addressed if young-earth creationism was to continue to have a significant impact on the issue of origins both within and outside the Christian community (Vardiman, 2000, p. 7).

We do not believe that radiometric age-dates pose a significant problem for creation science. There have been many studies conducted by young-earth creation scientists that have demonstrated questionable results and the subjective nature in which radiometric data are applied (Froede, 2010, and references therein). If creation science is to move to the adoption of accelerated nuclear decay (a clearly stated objective of the original RATE study), then it should be based on defensible science and not just ideas, theories, or miracles.

"Natural History" versus "Bible History"

Perhaps our greatest concern regarding the RATE study is the appeal to the adoption of naturalistic philosophy (not science) to define/defend Bible history. Creationist giants from the last generation (Whitcomb and Morris, 1961; Morris, 1985, 1986; Morris and Clark, 1987; Morris and Parker, 1987; Gish, 1995; Wilder-Smith, 1981, 1993) openly rejected the assumptions and results of radiometric dating. Has new experimental science validated radiometric dating techniques and age assumptions? What evidence requires acceptance of accelerated nuclear decay? With only one generation separating us from these giants, several eminent young-earth creationist scientists seek to adapt naturalistic radiometric dating via accelerated nuclear decay to Bible history. For many, this may come as a surprise to learn that the RATE findings did not disprove radiometric age-dating.

We believe that extraction of "radiometric age-dating" from the worldview of naturalism carries too many philosophical/theoretical assumptions (not science) when applied to Bible history (Figures 1a and 1b). To date, little experimental science has been conducted by young-earth creationist scientists in support of naturalistic radiometric dating methods, while many articles have been written identifying its many inconsistencies (see

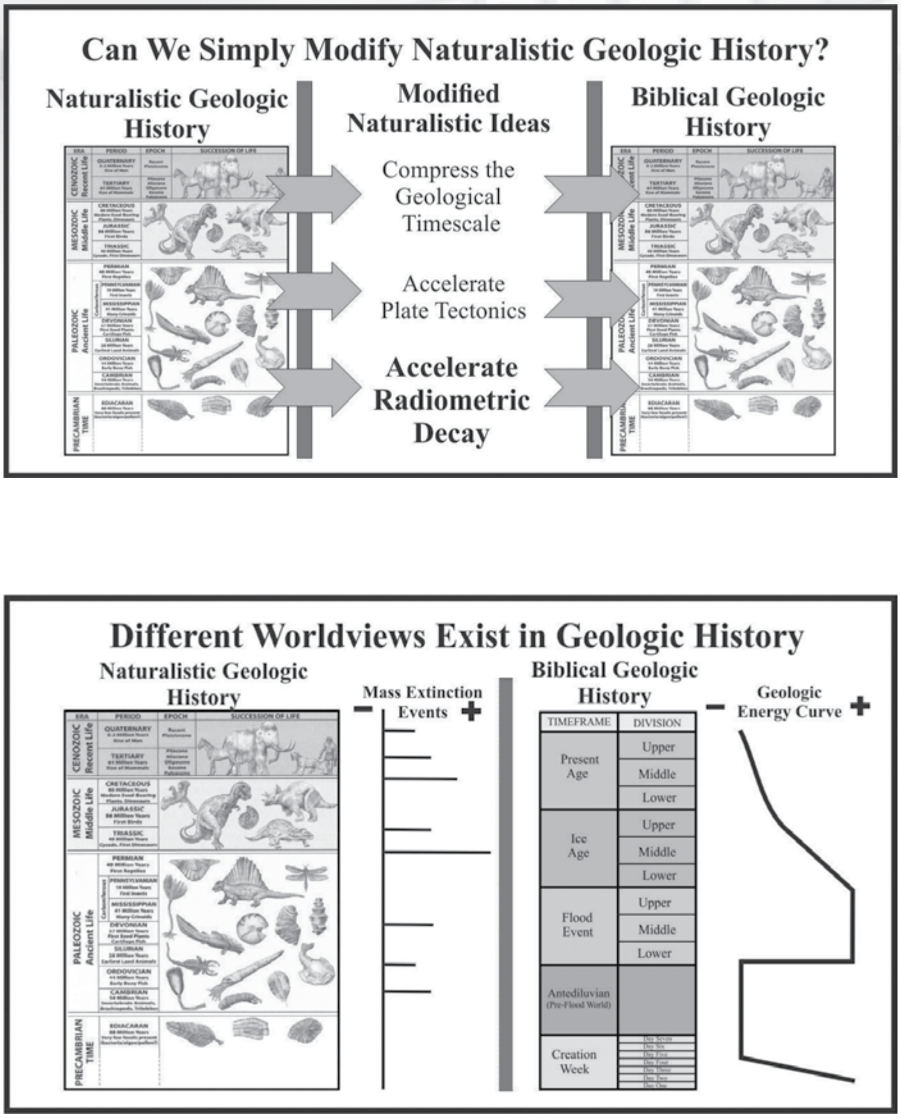

Figure 1. Naturalists and creationists operate in two different worldviews as demonstrated by these diagrams. (A) Some creationists suggest that we can simply take ideas developed in naturalism and with some modification apply them to biblical history—retaining the naturalistic geologic timescale. This is the idea behind accelerated nuclear decay and its adoption in creation science. (B) We reject this philosophy and believe it unnecessary in defining and defending biblical history. The two philosophical/scientific approaches to earth history are completely different. The naturalistic geologic timescale defines time both by evolution and radiometric dating. Biological evolution and mass extinction events have long served to divide time within the geologic timescale. Today, radiometric dating is supplanting biological evolution. Biblical geologic history suggests that the two greatest periods of geologic energy occurred during the Creation Week and the Flood. We believe that these differences do not allow for any reconciliation between the two competing worldviews. Hence, the concept of accelerated nuclear decay is unnecessary to biblical history. This is not a rejection based in science as no science presented by the RATE study (or naturalists) has demonstrated a required acceptance of accelerated nuclear decay or the adapted naturalistic geologic timescale.

references in Froede, 2010; Froede and Akridge, 2012). Humphreys claims that radiometric dating can be accommodated in biblical history. Where is the science behind this idea? What evidence proves accelerated radiometric decay is the only answer?

Unambiguous Evidence for Nuclear Decay

Humphreys states that there is over a century of evidence supporting the idea of naturally occurring nuclear decay. What information is presented in the RATE study? The same five points outlined in Humphreys' letter. The defense of any idea—especially one that claims support from science—should be well documented and backed by experimental evidence. To contend that accelerated nuclear decay has occurred necessitates a young-earth creationist defense of naturalistic radiometric dating methods—work that the RATE study group did not conduct. As young-earth creationists, our initial starting point should not be blind (i.e., without scientific evidence) acceptance of naturalistic radiometric assumptions, dating methods, and age-dates. Some of the naturalistic radiometric age-dating results are ambiguous, and young-earth creationists have documented this fact (Austin, 1994; Woodmorappe, 1999; Snelling, 2009; Froede, 2010, and references therein). What follows is an examination of Humphreys' main points.

1. **Mother and daughter isotopes together**. While a clear explanation of the thought behind this statement is made, missing here (and in the RATE volumes) is scientific documentation. We are told how resistant the zircon crystal is to external or internal forces following crystallization. Humphreys also conveys that as the zircon crystallizes, it rejects the element lead (Pb) from its crystal lattice but prefers (and adds) uranium. Where is this information found? Is this the only explanation for why zircons seem to contain uranium and not lead? This information is taken from the naturalistic literature, so is there a bias?

Humphreys claims that a second line of evidence supporting the idea that zircons are impenetrable and fully reliable geochronometers can be demonstrated by "billions of years' worth" of lead (^{206}Pb). At this point, Humphreys assumes that all of the lead found in the crystal lattice is from decay, but is this necessarily true? How do naturalists know that none of the lead (^{206}Pb) identified in the zircon crystal was captured and contained as it crystallized? This is an assumption. Unfortunately, references were not provided to substantiate many of Humphreys' beliefs. Since he claims that zircons "are very hard, refractory, dense, tightly-packed crystals," he appears to automatically accept the naturalistic claims that all lead contained in the zircon is solely derived by radiometric decay.

Is the trust that Humphreys places in zircon crystals warranted? Zircons have a hardness of 7.5 on the Mohs' scale of hardness. This means that it is harder than quartz (with a hardness of 7) but softer than minerals with a higher value (Figure 2). Is it impenetrable? Certainly not. Naturalists have documented instances where crustal gases have penetrated zircons leading to unacceptable radiometric ages (see references in Froede, 2012a). Perhaps the most challenging data against using zircons as geochronometers has come from a recent study of zircons from the Jack Hills region of Australia. This location has provided zircons age-dated by naturalists to the oldest crustal rocks on Earth, ~4.4 billion years (Rasmussen et al., 2011). However, age-dating assumptions constructed from these zircons have recently come into question.

> Mineral inclusions in Jack Hills zircons have previously been interpreted as primary; however, our data show that zircon is not always an impermeable capsule that preserves

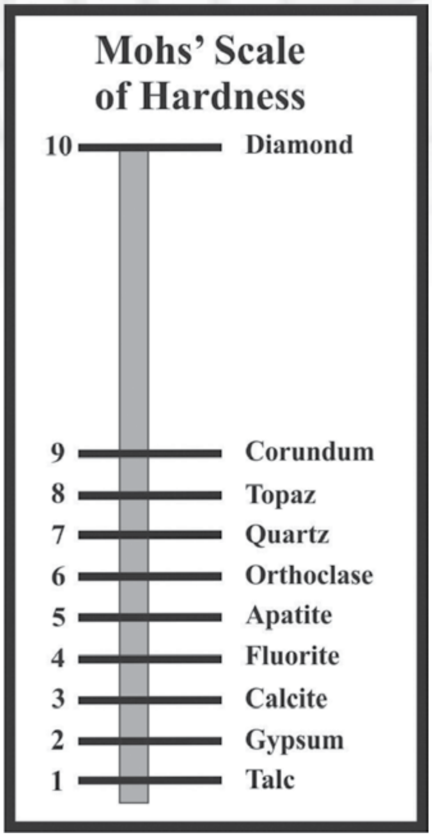

Figure 2. Geologists have created a subjective scale of hardness (Mohs' scale of hardness). The numbers are relative and only indicate that one mineral is harder or softer than the one adjacent to it. The ten minerals identified are the standard, and everything else is applied in relation to those standards. Diamond is significantly harder than the minerals below it, and its distant location up the scale is reflective of that difference. Zircon has been identified as having a hardness of 7.5. This does not mean that it is 7.5 times harder than talc (hardness of 1); rather, it is harder than quartz (7.0) and softer than topaz (8.0). We suggest great caution when assuming that minerals on this scale above a certain value are believed by their hardness to reflect impenetrability.

> the primary inclusion mineralogy. Instead, zircon grains are readily infiltrated by fluids along fractures and metamict domains, as well as along cryptic pathways (Rasmussen et al., 2011, p. 1146).

Note that the "cryptic pathways" equates to penetration by still unknown pathways or means—naturalists cannot explain how some elements/minerals penetrated the zircon crystal. There simply is no evidence of penetration—yet it is there. This discovery should call into question age-dating assumptions where zircons are assumed to be impenetrable containers that are useful, reliable, and unquestionable as geochronometers. Perhaps a better avenue of study for RATE would have been an examination of the naturalistic assumptions of zircons in radiometric dating.

2. Radiohalos. Our present understanding of radiohalos may not be the "end all" answer to the question of how the earth formed and how old it might be. Radiohalos might be interpreted either as support for an old earth, or alternately, massively accelerated nuclear decay on a young earth (due to the ubiquity of fully-formed uranium halos in what are assumed to be Flood-related rocks). One may not be able to make an airtight claim either way.

A competing interpretation is the "fiat creation" of basement granites (largely promoted by Robert Gentry's work [1988] and unassociated with Flood deposits and the seemingly massive numbers of $^{214,\,218}$Polonium halos in them), but this does not explain the halos described by Snelling and Armitage and others in Flood-related rocks (see discussion and references in Snelling and Armitage, 2003, 2008).

Nevertheless, serious questions remain regarding the source and composition of halo radiocenters (and in particular, the various alpha emitters). Are they submicron-sized shards of zircons or could they be radionuclide salts or some combination of the above? If they are salts, how can the "scavenging of polonium by S and Cl ions" mechanism proposed by Snelling compact them into the submicron sizes required to form halos with highly resolved rings? Why did the ongoing flux of repeated hydrothermal flows as postulated, not wash away or otherwise dissolve the newly formed radiocenter salts?

In the case of short half-life halos, how can we explain the rapid decay necessary to form the submicron radiocenters required for the highly resolved rings before the required number of atoms to form a halo (500 million to 1 billion) decay away?

How were the radiocenters transported and emplaced within the host rock? Can hydrothermal flows adequately explain this, and could experiments be designed to test this theory? When did compaction of the host rock occur allowing the ^{238}Uranium (and other) halos to form? Why, for example, do we see long, diffuse radiation stains right next to fully-formed halos with highly resolved rings in the same biotites? These questions and more need to be resolved (Armitage, 2012; personal communication).

As mentioned, the radiocenter compaction mechanism remains unresolved, but also to be worked out are certain timing issues: radiohalo rings would not form unless the host material is crystallized enough to restrict further movement and perhaps maintain the integrity of the radiocenter. However, the emplacement of the radioactive source material cannot occur unless the host material is permeable enough to allow radionuclides (within zircons?) to pass through.

Further study may reveal important answers to these and other questions. In using a scanning electron microscope, Mark Armitage has initiated a promising area of study examining the radiocenters of various radiohalos. If funding can be found (he is currently accepting donations for this project), he hopes to conduct an elemental analysis of the radiocenters with the goal of understanding their formation. This may answer questions that either strengthen our present knowledge of radiohalos or move us in new directions. It should be noted that the cryptic inclusions and the surface crack issues highlighted by new work on zircons could also impact the study of radiohalos.

Could antediluvian groundwater have contained dissolved uranium and its daughters? Recent environmental investigation of groundwater across parts of the United States has identified these radioactive elements in several aquifers (Cowart, 1980; Krishnaswami et al., 1982; Gilkeson et al., 1984; Hess et al., 1985; Zapecza and Szabo, 1988; Focazio et al., 2001), including the Florida peninsula (Burnett et al., 1987; Harada et al., 1989; Cowart and Burnett, 1994). Clearly, these radioactive elements were not created by hydrothermal processes invoked to explain radiohalos in the Flood framework. Could they represent possible pre-Flood conditions and host rock containment? We merely propose that we need to be cautious in what is accepted as irrefutable evidence in support of both the mechanism and results obtained from studies of radiohalos.

The bottom line is that although we seem to be on the right track, not enough is known about radiohalos to offer them as the Holy Grail of recent, rapid creation and a global Flood. The work that has been done to date is laudable, but as our long-age detractors would be quick to say, we should not be afraid of where our science takes us, and we have much more science to conduct.

3. Helium together with uranium. This topic has already been discussed in the young-earth creationist literature (see Froede, 2012a). Humphreys believes that zircons are the perfect containers for geochronometry. Froede documented from science literature that excess argon and excess helium (derived from crustal rocks and not by decay) have been identified in zircons by naturalists and even some young-earth creationists. Naturalists contend that these gases were derived from the lower sections of earth's crust or possibly even the mantle over billions of years, while creationists counter that they probably were derived from these same source areas but during the Flood. The usefulness of zircons as geochronometers has already been challenged by science (Rasmussen et al., 2011). That they have been proven to contain excess argon and helium has also been documented by science (Froede, 2012a). Therefore, the use of argon or helium content in zircons for age-dating purposes should not go unchallenged. As a result, RATE should no longer support this concept. Note that the latest naturalistic debate rages over the age of the Grand Canyon (Flowers and Farley, 2012) where helium in the mineral apatite occurs not as a function of radiometric decay but rather by diffusion from underlying crustal rocks. In this case, the new age of the Grand Canyon (i.e., 70 Ma) is inferred by the capture of helium in the apatite minerals as the underlying crustal rocks cooled and crystallized while being eroded and uplifted. In this case, an age-date is made based on helium diffusion and not decay—hence our call for caution in blindly accepting naturalistic argon and helium age-dates in rocks and minerals.

4. Fission tracks. The philosophical assumptions and empirical methods of fission-track dating were not questioned by Dr. Andrew Snelling in his examination of the traces from various volcanic rocks across the southwestern United States (Snelling, 2005). In fact, Snelling's investigation and claims regarding the numerous etchings in the many multimillion-year-old zircons appear to require a choice: (1) either accept the physical evidence requiring the million-year-old age of the zircons, or (2) believe that only accelerated nuclear decay can bring those ages into agreement with the biblical timescale. No recently erupted volcanic rocks (containing zircons) were examined to test the idea that age directly corresponds to etchings in the zircons (we suggest this approach as a test of fission-track dating). A brief review of some of the naturalistic geologic literature on this method appears to offer another perspective. Harper stated:

> Although the experimental procedures used in fission-track dating are extremely simple, *the method is somewhat subjective* in that it involves visual identification (after etching) of fossil fission tracks in naturally occurring materials many of which are riddled with lattice defects which can be confused with true fission tracks. For this reason the method is perhaps best applied to young volcanic glasses (Harper, 1973, p. 8; italics added)

Others have also recognized that etchings may be caused by other sources:

> If a mineral contains an atom fraction of one part per million of uranium, and if we consider any hypothetical surface within the material, 2000 fission fragments will cross each square centimeter of surface every million years, Provided these fragments produce tracks that are permanent, a simple count of the track density together with a measure of the uranium content allows the age of the sample to be measured. *This assumes that no other sources leave tracks which might be mistaken for ^{238}U spontaneous fission tracks* (Fleischer et al., 1968, p. 418; italics added).

Can age-dates established by fission-track dating stand alone, or do they need to be supported by other radiometric methods? The answer to this question demonstrates the subjectivity of fission-track dating in naturalism.

> The dating technique—called fission-track dating—has been applied to a wide range of materials, and … has yielded ages that are in agreement with 'known' ages over a wide time span (Fleischer et al., 1968, pp. 418–419).

Despite the confidence placed in fission-track dating, two volcanic tuffs were calibrated by potassium/argon dating methods due to ambiguous values of the ^{238}U spontaneous fission decay constant and other complexities (Hurford and Hammerschmidt, 1985). In one study, apatite and zircons from the Fish Canyon Tuff (San Juan Mountains, Colorado) were provided to over 50 laboratories for fission-track dating (Naeser et al., 1981). The results indicate that the differences in age (approximately five million years) were due to differences in the assumed decay constant. Despite its presentation as an unquestionable dating method, fission-track dating still remains subjective and open to serious questions. Further empirical studies are warranted by creationists to test naturalistic assumptions regarding this dating method.

5. Heat from nuclear decay. The concept that heat generated through accelerated nuclear decay would not somehow impact everything on earth is a most perplexing issue. This idea is perhaps the most "miraculous" of the many statements presented by RATE scientists. Nothing of evidence was presented to support this concept. A simple test would be to examine the point in the rock record where the Flood was initiated and accelerated decay would have occurred. Rocks below this boundary would be cooked (due to the release of heat), and those above would not, having transferred heat away through miraculous processes (i.e., the proposed heat transfer theory). This contact was not identified, nor was it even proposed. This is the physical evidence necessary to carry theory to reality; otherwise we are dealing with simple storytelling and the miraculous. Let us have the location and the name of the globally defined metamorphic/igneous rock layer that supports the heat transfer model proposed by RATE scientists whereby accelerated cooling can be tested.

No Observation Here, Just Theory

Humphreys claims that

> Froede and Akridge say that creationists should not accept accelerated decay or accelerated cooling because nobody has yet produced a complete theoretical explanation of them.

This is a "red herring," as we made no such claim. Rather, we challenge all the theoretical assumptions made by RATE scientists regarding naturalistic-based radiometric dating and the many undefended concepts touted by that group as evidence. Humphreys further claims:

> In saying they want "empirical evidence of rapid-to-instantaneous crustal cooling," they don't seem to recall their own quotation just a few paragraphs earlier of me citing several items of such empirical evidence. The items are: (1) the rapid cooling of radiohalos (Snelling and Armitage, 2003, p. 260.), and (2) removal of much heat from concentrations of radioactivity (Baumgardner, 2000, p. 86).

Both of these "evidences" are lines of reasoning (i.e., deductions). As we have just discussed, neither are definitive or "scientific" as evidence. They are interpretations based on assumptions. Where is the evidence that all radiohalos reflect rapid cooling? Humphreys provides deduction, and we seek physical evidence. This is an important point of distinction, as we believe that many such "RATE evidences" are deductions based on conjecture and assumptions, some of which we hope are now evident.

No failure in understanding dating methods or their many assumptions

Again, Humphreys assumes that zircon crystals provide the perfect geochronometer in support of the naturalistic methods used in radiometric dating. He takes us to task over the apparent overwhelming evidence that there is no alternative. But is this science or presumption? If zircons are no longer on the table as a top-tier line of evidence, then what other methods and age-dates might fall into question? Humphreys offers support from naturalistically derived radiometric age-dates largely spanning the Phanerozoic presented in his Figure 1. That the many dates appear to cluster around a statistically derived line of his choosing purportedly proves that radiometric age-dating supports RATE and should force our acceptance of accelerated nuclear decay. But is this true? Humphreys offers an interpretation of data based in naturalistic philosophy. The age-dates presented are never in question, only the fit of the line. Why are we to accept the data when the science behind it is subject to manipulation and rejection (where it does not fit the naturalistic geologic timescale)? While Humphreys is quick to adapt the data from Woodmorappe (1979), he neglects to mention that the cited article addresses the subjective nature of using radiometric dating.

> The use of radiometric dating in geology involves a very selective acceptance of data. Discrepant dates, attributed to open systems, may instead be evidence against the validity of radiometric dating. A systematic and critical review of dating applications is presented; emphasis being placed on the geologic column. Over 300 serious discrepancies are tabulated. It is, however, demonstrated that most discrepant results are not published. Discrepant dates capriciously relate to petrography and regional geology.

Neither internal consistencies, mineral-pair concordances, nor agreements between different dating methods necessarily validate radiometric dating. The large spread of values for igneous and metamorphic rocks (especially of the Precambrian) may indicate artificial imposition of time-values upon these rocks (Woodmorappe, 1979, p. 102).

We believe that this statement still holds true today, and it remains our point of argument against the blind acceptance of the ideas held out as evidence from the RATE study. We are still looking for evidence—we are provided with theory and philosophical concepts based in naturalism.

Humphreys makes the following statement.

> Using isochron methods on single rocks or formations, RATE did notice consistent differences between ages using different isotopes … Beta-decay methods gave younger ages than alpha-decay methods, and lighter nuclei appeared to give younger ages than heavier nuclei. Contrary to Froede and Akridge, these differences are not an indication of unreliability. Instead, they are to be expected from the *theoretical work* of Eugene Chaffin. They are evidence not only that accelerated decay occurred, but also that different types of nuclei experienced different degrees of acceleration (italics added).

Can this "theoretical" work behind the idea of isochron discordance be tested before we automatically accept it along with accelerated nuclear decay? If the earth's entire atomic structure were accelerated, can we find physical evidence to defend this idea? Humphreys clearly states that Chaffin's work is theoretical, but is this a proof? We are unqualified to even propose how to test this conceptualization, but it would be a means of supporting this assumption. It must be understood that our caution is not based on any rejection of science; rather we question the concepts, theories, and apparent quantum jump to purported proof. We contend that RATE results are a good starting point for further creationist study and not the end point. While we remain skeptical of its many claims to truth, this does not make us "anti-science."

Are RATE results really useful to creationists?

Humphreys identifies three key points that young-earth creationists can take away from the results of the RATE study: (1) accelerated nuclear decay provides young-earth creationists with a practical means of understanding earth's biblical history, (2) decay rates are relatively the same within each dating method and during the time of acceleration, and (3) radiometric decay during the Flood year approximates to 1.25 million years per real Flood day. These are all worthy of further study, as they are not based in science as much as they are concepts and ideas based in naturalism. Again, we are looking for the evidence that supports these points—where are these ideas demonstrated?

The conversion factor offered by Humphreys is intriguing. In applying the calculation of 1.25 Ma of accelerated nuclear decay per Flood day (assume 360 days/Flood year), we arrive at 450 Ma. But this span of time is meaningless. To what part of the naturalistic geologic timescale does it apply? A larger issue is the application of this conversion factor to Precambrian rocks. For example, naturalists contend that asteroids and the moon (Figure 3) are the same age as the earth, approximately 4.55 billion years old. However, these would be "Creation Week" rocks in the biblical framework. How does the "1.25 Ma conversion factor" apply? It simply does not work. This is why we challenge the RATE results that claim we can merely accelerate radiometric decay and fit all the rocks, minerals, and fossils in a compressed form to the naturalistic geologic timescale (Figure 1a). It would have been more useful if Humphreys proposed an accelerated decay rate of 12.64 Ma/Flood day, as this would have extended accelerated decay across the entire 4.55 billion years of naturalistic earth history.

Figure 3. The moon was created on Day 4 of the Creation Week. Naturalists have used rocks collected during Apollo missions to age-date it (and the earth by association) to 4.55-billion years old. The RATE study offered no means of understanding how we can take this assumed radiometric age and correlate it to biblical history. Humphreys' 1.25-million-year acceleration per Flood day conversion factor also fails to explain how the moon rocks can be "accelerated" to conform to a 6,000-year-old earth. We propose that differences between the two competing worldviews (Figure 1b) do not require a unification of accelerated nuclear decay of naturalistic radiometric age-dates and biblical history.

Perhaps a greater challenge in the acceptance of radiometric dating (and implied acceleration) comes from work conducted by young-earth creationists and some naturalists on materials that are inconsistent with their known age (or assumed naturalistic age). Several young-earth creationists have conducted scientific experiments, and the results indicate radiometric age-dates ranging from zero to hundreds of thousands of years (see Froede, 2010). Naturalists have also questioned (but not rejected) serious radiometric age-dated discrepancies from rocks and fossils (Rubin and Taylor, 1963; Dalrymple and Moore, 1968; Kaufman et al., 1971; Ralph et al., 1973; Stapor and Tanner, 1973; Brooks et al., 1976). In a very revealing article, Villeneuve (2004) discussed the many problems with accurate radiometric dating methods, suggesting specific analytical methods to achieve the desired results. Recently, two studies found flaws in the age-dating assumptions using uranium and samarium isotopes (Miller, 2012), and while neither error proves fatal, they reflect the naturalistic bias and unquestioned belief in deep time and an old earth—values that run counter to biblical history. Froede (2012b) recently documented the problems created by naturalists re-dating specific minerals from lunar rocks and its adverse impact on the popular "Magma Ocean Model." The answer to resolving this serious age-dating issue—more radiometric dating!

We believe that the acceptance of accelerated nuclear decay during specific periods of time in earth's past has not been demonstrated scientifically by the RATE study. Much of the "evidence" in support of accelerated nuclear decay depends on the miraculous, which is not science. Of particular concern is the question of why God would use accelerated nuclear decay when He normally uses an economy of miracles to do His work. To claim that accelerated nuclear decay happened demands empirical explanations, one of which is how disposal of liberated heat was accomplished without destroying much or all of the planet. While advocates of accelerated nuclear decay are considering time dilation and events happening in other dimensions to support their work, other researchers are using these same ideas to support a belief in deep time (e.g., Schroeder, 1997). Accelerated nuclear decay seems to take exception to Occam's razor.

The seeming reliance on naturalistic philosophy and its radiometric dating methods should make any young-earth creationist raise questions regarding its need or validity. There should be physical evidence that supports the idea of accelerated decay—at present that evidence appears to be solely from radiohalos. But questions remain, and further experimental science should be conducted. The application of an accelerated conversion rate of 1.25 Ma/Flood day needs to be demonstrated scientifically, and some means must be developed to differentiate between pre-Flood/Flood and Flood/post-Flood radiometric age-dates (and methods). There are numerous examples of serious radiometric dating problems derived from recently erupted volcanic materials to require caution in moving forward with blindly accepting accelerated nuclear decay (see Froede, 2010). We are hopeful that the RATE study group will continue to address these questions. Again, we are grateful for Dr. Humphreys' time and effort in writing a letter seeking to have a positive dialogue regarding the RATE study results. We appreciate this opportunity to respond and look forward to future discussion regarding the results of the RATE project.

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RATE's Practical Applicaton

Editor:

I cannot argue with the contention that the Radioisotope and the Age of the Earth (RATE) study would have had more impact if it had been accompanied by more explanations about such things as the cooling requirement; i.e., a large amount of decay would (or perhaps should?) have been accompanied by a huge release of heat energy (Froede and Akridge, 2012). I mean, every theory can always benefit by having more corroborating evidence. So, no argument there. And I really don't want to diminish the point of the article, which was to encourage more research into this area. I think we can all definitely agree on that.

But it's really stretching things to say that it has no practical application. Maybe it's just a question of semantics here; I don't know. The Uranium/Polonium halo findings by Gentry and then Snelling are almost earthshaking. To my mind, it is virtually irrefutable that the presence of the Po halos next to the Uranium halos on the same level of the biotite crystals proves a brief period of vastly accelerated nuclear decay. This totally demolishes, all by itself, the major assumption behind radioactive dating. That sounds pretty practical to me.

Also, the finding of C14 in diamonds and in every coal bed is pretty practical in demolishing the contention of great age for those things. Why didn't they experience accelerated decay too? I don't know. But carbon is much smaller and vastly more stable than the bigger atoms like uranium, etc. I'm no expert in quantum mechanics, but it seems pretty reasonable that whatever caused the accelerated decay in big atoms may not have had much effect on the smaller ones. I do not know; I'm only a bachelor in electrical engineering, not a PhD in particle physics.

Isaac Newton didn't understand what gravity was. Did that diminish the practicality of his work in gravity? Not a bit. He more or less said that he didn't have a clue as to what it was or why it worked. He just said, "OK, here it is, and here's what it does." He didn't have to prove everything about gravity for his findings to be useful.

In the secular world we see the so-called "inflation" of big bang theory. Does it have any cause? No. Any explanation? No. But secular astronomers fall all over themselves to embrace it. The same could be said for star formation. It cannot happen! But that doesn't stop them from embracing nonsensical explanations as to why we have all the stars. Therefore, if a secular scientist wants to discount accelerated decay because we do not have all the answers, he does not have a leg to stand on. And beside that, with RATE we have actual observations disproving uniformitarian assumptions critical to radiometric dating. We do not just have baseless theories.

Do we know where the heat went? No. Do we have quantum mechanical equations showing how it all works? No.

Do I care? No. It's sufficient for me to know that it totally discredits radio dating. To me, that's exceedingly practical.

Doug Lindauer
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Authors' Response

We appreciate the perspective offered by Mr. Lindauer regarding our recent article (Froede and Akridge, 2012) and agree wholeheartedly with his first paragraph. However, we think he misses an important point in the rest of his letter—the distinction between experimental science and forensic history. The latter is necessarily more limited and less certain by its very nature. And forensic history is the category under which the RATE study's conclusions fall and are commonly applied by its researchers.

Lindauer takes exception to our claim that the RATE study results lack practical application, citing radiohalos and ^{14}C in diamonds and coal as practical evidence in defense of the young-earth framework of history. Practical application in an apologetic sense is one thing; practical application in explaining the specifics of forensic history is more difficult. The former makes the biblical framework more likely; the latter makes it almost indubitable.

With regard to radiohalos, Gentry's (1988) work supported the ex nihilo creation of radiohalos, while Snelling focused on radiohalo support of the hypothesis of accelerated decay during the Flood. See our discussion regarding radiohalos in reply to Humphreys' letter (Froede and Akridge, 2013). Gentry's work presented contrary evidence to the naturalists' old-earth theory, while Snelling's evidence supports, but does not demand, a strictly biblical interpretation.

What of the evidence of ^{14}C in diamonds and coal? Baumgardner (2005) reported that ^{14}C was found in all of the diamond chips and subsequent diamonds analyzed. But the results were not consistent, and therefore not definitive.) He states:

> Whereas there was little statistical variation in 14C/C levels among the first six diamond samples, this latter set of samples showed a wide spread in their levels, from a smallest value of 0.12 pMC to a largest value of 0.39 pMC.
>
> Whereas five of the first six diamonds were from deep mines in volcanic kimberlite pipes, all of the second set of diamonds had resided near the earth's surface in water-deposited alluvium, probably for most of the time since they were explosively erupted from subcrustal depths inside the earth (Baumgardner 2005, p. 612).

What did these varying results imply? Baumgardner clarifies:

> Prior to the time we received the results from the Namibian diamond samples, our working hypothesis on the origin of the 14C in the diamonds was that it likely represented primordial 14C formed during the creation of the earth itself. But with these newer results that showed such large 14C variation from one diamond to the next, we began to explore the alternative possibility that much of the 14C in these diamonds might have been produced recently, but *in situ*, from a very large flux of thermal neutrons.
>
> Episodes of accelerated nuclear decay in the recent past of the sort suggested by our other RATE studies would have generated extreme neutron fluxes throughout the continental crust (Baumgardner, 2005, p. 613).

The extreme neutron flux is one explanation for the observed data but is not the only possibility. Such a flux should leave other lines of evidence. None were offered in the RATE study. Our objective is to follow the science. Such extreme neutron fluxes would have altered the atomic structure of *everything* on Earth, meaning that many lines of evidence should be present.

Snelling (2005) offered a hydrothermal model for radiohalo formation. He proposes that fluids rich in radioactive isotopes penetrated certain types of rocks during the Flood. Once captured, the decay rate of these isotopes was accelerated, creating Flood-formed radiohalos. Perhaps these same types of fluids contained ^{14}C? Its penetration into a dilated diamond lattice would have resulted in its near-surface capture. Obviously more research is needed to explore this or other possible ideas. While the presence of ^{14}C is a challenge for naturalistic geology, it is not yet clear that the data cannot be explained in the old-earth framework. In the meantime, it remains a powerful empirical argument for creationism, for which we applaud Baumgardner.

Regarding ^{14}C in the many Mesozoic and Tertiary coal samples collected by Baumgardner, there are problems with his assumptions and conclusion.

> Put simply, the evidence of 14C throughout the Phanerozoic part of the geological record argues the half billion years of time uniformitarians assign to this portion of earth history was instead a much briefer interval. Moreover, the relatively narrow range of 14C/C ratios suggests all Phanerozoic fossil organisms prior to somewhere in the middle to upper Cenozoic were contemporaries and perished almost simultaneously in the not so distant past (Baumgardner, 2005, p. 624).

But this explanation is also not unique. Much of the groundwater found across the earth contains naturally-occurring ^{14}C in varying concentrations. It has been used to trace subsurface flow and age-date aquifers since the late 1950s (e.g., Münnich, 1957; Brinkmann et al., 1959; Hanshaw et al., 1965; Pearson and White, 1967; Spiker and Rubin, 1975; Winograd and Pearson, 1976; Sudicky and Frind, 1981; Sanford and Buapeng, 1996; Kalin, 1999; Castro et al., 2000; Sanford, 2002). It has also been used to disqualify unacceptable ^{14}C age-dates:

> Finite radiocarbon dates from woody Pleistocene samples in eastern Dauphin Island were caused by ground water and other contamination (Otvos, 1979, p. 297).

That the Flood would have flushed both connate and meteoric-derived ^{14}C through sediments should not be in doubt. But ^{14}C continues to flow through the world's aquifers even today, and anything removed from the subsurface saturated by groundwater would also contain traces of naturally-occurring ^{14}C. We would suggest that ^{14}C would be expected almost everywhere saturated materials would be subject to subsurface groundwater flow. Hence, finding traces of ^{14}C in coals of Mesozoic and Tertiary age would be expected based on our present state of knowledge of ^{14}C in the world's aquifers. That is one reason we suggest that more in-depth research is needed.

As noted in our response to Humphreys, we cannot support Mr. Lindauer's unqualified acceptance of the RATE results. For many years, creationists have complained about naturalists equating their speculative natural history with hard science. We cannot be guilty of doing the same. RATE researchers proposed that age-dates collected by naturalists merely reflect accelerated decay occurring during the Creation Week and the Flood. While the RATE study is a good start, it is nowhere near the end of the story. Its practical applications in terms of positively, specifically, and conclusively reconstructing biblical natural history remain to be demonstrated.

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The Origin of Birds

Editor:
At 65 million years we have in the fossil record modern birds such as owls and geese, followed by penguins, then a whole host of modern birds. Modern birds go back as far as 130 million years in the form of *Gallornis straelen* (Jones, 1999, p. 221), and it is possible that they go back even farther in time.

Before this, there are a number of other types of birds, one such type being the *Neognathae*. Some now feel they are represented by living birds. They had ancestors that looked modern, back at 150 million years ago. This is the same age as *Archaeopteryx*. These facts sever any supposed link between birds and reptiles, the shared-features model being the answer.

Examples of this can be seen in the case of tetrapods at 397 million years, and with a history going back into Silurian rocks, before the main lines of lobe-finned fish, showing the shared features between these and tetrapods are due to the life-forms' genetic potential, or God created some of them and their genetic potential produced the rest (Brown, 2010).

Another example is that of the egg-laying mammals, which have reptile-like features made of mammalian tissue, plus the oldest placental mammal at 160 million years is as old, if not older than, egg-laying mammals (Brown, 2011). Any shared features between reptiles and birds are just the same principle in this model.

The age of these modern-looking birds and *Archaeopteryx* puts things into perspective. Dinosaurs had feathers—so what? All the evidence points to the shared-features model being the reason for such features, and it is this that is constantly being mistaken for evidence of evolution, when in reality it is all part and parcel of creation.

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The Origin of Life Needs a Creator

Editor:
We use mathematics on a daily basis and trust in it at times without question or thought. However, when it comes down to the origin of life, many people's lack of trust in the maths against life coming by itself are quite remarkable! Many treat the maths as rubbish and complete twaddle.

The figure against life arising by itself, by chance, is so large that it is beyond most, if not everyone's, comprehension. Even Richard Dawkins goes along with life not coming by chance in his book *The Blind Watchmaker* (Dawkins, 2006, p. 43). He also says that single-step selection would also be of no use. However, he then goes on to use two different computer programs to produce a line from Shakespeare in the correct order, from the 26 letters on the keyboard of the computer. A program called BASIC, a rather baby-like format, did it the first time in half an hour. PASCAL, a much faster program, did it in 11 seconds. This is supposed to represent life coming by cumulative selection, where the computer program picks out the bits it "likes," and then holds onto and builds on them.

The term "program" is defined as the sequence of instructions fed into a computer in order to enable it to carry out a process. A program is designed by an *intelligence* to carry out what that intelligence designed it for. In this case it was man who designed it—it does *not* come by itself. The bottom line is that in all these computer examples, and even work in the lab, it is always a case of intelligence being behind it all!

Back in 1955 Stanley Miller created conditions that, after several attempts, produced some amino acids. As part of the experimental apparatus, Miller included a trap to separate the amino acids as soon as they were formed. In real life, those amino acids would have been broken down by the same atmospheric conditions that produced them. Chemicals are being formed and broken down all the time.

So, we are back to the mathematics against life being formed by itself because the figure against it is just too large to comprehend!

Summing it up with something you could put on a T-shirt is, *Evolution Isn't Bigger than Mathematics—BUT GOD IS!*

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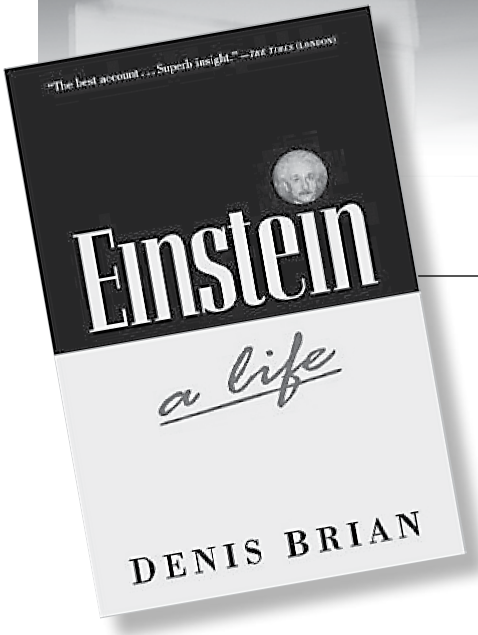
Media Reviews


"The best account . . . Superb insight." —The Times (London)
Einstein
a life
DENIS BRIAN

Einstein—A Life

by Denis Brian

John Wiley & Sons, New York,
1996, 509 pages, $20.00.

Author Denis Brian is a British journalist with an interest in science history. His other books explore the Curies and Nobel Laureates in general. The 500 pages of this Einstein biography are ponderous, and one grows weary from the minutia. Author Brian researched Einstein's life almost day by day and includes food preferences, vacations, crank mail, illnesses, and chance encounters with people. I will assume the reader is familiar with the science accomplishments of Einstein and will list some of the book content that was new to me.

Albert Einstein's intellect is diminished by a documented lack of moral principle and responsibility. When his mistress Mileva Maric gave birth to daughter Lieserl in 1902, Einstein pressured Mileva to give the girl up for adoption because he was busy with studies (pp. 48, 186). Mileva may never have fully recovered from this experience. After eventually marrying Mileva, Einstein carried on relationships with other women, perhaps platonic. These flaws in Einstein's character are seldom expressed. The book makes little mention of any positive parental guidance during Einstein's youth.

Several quotes follow concerning Einstein's thoughts on faith and religion. In a conversation at age 46, he said "Try and penetrate with our limited means the secrets of nature and you will find that … there remains something subtle, intangible and explicable. Veneration for this force beyond anything that we can comprehend is my religion" (p. 161).

During an interview at age 50, Einstein was asked about religion. His reply: "I'm not an atheist and I don't think I can call myself a pantheist. We are in the position of a little child entering a huge library filled with books in many different languages. … The child dimly suspects a mysterious order in the arrangement of the books but doesn't know what it is. That, it seems to me, is the attitude of even the most intelligent human being toward God" (p. 186). This statement reminds one of similar sentiments from Isaac Newton two centuries earlier, that he resembled a boy playing on the seashore, looking at mere pebbles while the great ocean of truth lay undiscovered before him.

At age 73 Einstein wrote to a friend, "Don't think I've gotten religion in my old age, but I don't want to be included among the smug atheists and positivists who think they know all the answers" (p. 395).

Einstein spent considerable time conversing with Immanuel Velikovsky (p. 412). This Jewish scholar proposed many controversial ideas about earth history. For example, Velikovsky suggested that the Genesis Flood was triggered by the near approach to earth by planetary objects. Einstein didn't accept the idea but often was attracted to unpopular people. In 1955, a visiting African-American musician, Marian Anderson, was refused lodging at a Princeton hotel. Einstein heard about this and quickly opened his own home to the singer (p.421).

Einstein enjoyed sailing and had his share of mishaps, including a near drowning at age 56 (p. 280).

Earlier, at age 49, Einstein was homebound for a year due to a "strained heart" and nervous collapse. This illness may have been a precursor to his eventual death from a ruptured aneurysm of the abdominal aorta (p. 426). His cremated ashes were scattered upon the Delaware River, while his brain and eyes were harvested for study.

The Bible was apparently not a key book in Einstein's life, despite the Old Testament explanation of his Jewish roots. Einstein (1879–1955) was uniquely gifted with deep insights into creation details. Sadly, there remained a lack of godly wisdom in his personal and spiritual life.

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Media Reviews

The Trumpet Vine, a Novel

by Joseph Mastropaolo

Trisphere Publishers,
Huntington Beach, CA, 2009.
212 pages, $13.00.

The Trumpet Vine is a science novel. The science is true; people and events are fiction. Denied full disclosure in their biology classes, a group of college students research the evidence for Darwinism on their own and find it to be an historical anachronism justified by fortunes made from nineteenth-century colonial imperialism. Amidst some humor and romance, the students conclude after a mock trial that evolution violates the First Amendment of the Constitution and therefore has no place in the science curriculum of any public school.

The research cited includes the evidence that biochemical similarities do not support evolution. An example is the phosphate protein family in animals used for such purposes as the transfer of energy packets including adenosine triphosphate (ATP). Fish, the lowest vertebrate life-form, use either adenosine triphosphate or guanosine triphosphate or both. The higher vertebrates, birds, use inositol pentaphosphate and the highest vertebrates, mammals, use red blood cells that contain 2,3-diphosphoglycerate. Through his fictional characters, Mastropaolo points out that no evolutionary pattern from simple to complex can be discerned from these observations. Rather, many systems including ATP are used in all vertebrates, and often all other life-forms from bacteria to humans as well.

This research was used by Darwinists to illustrate evolution, but no evolutionary sequence exists when the phosphate protein set is compared with the standard evolutionary tree. For example, mammals increase their 2,3-diphosphoglycerate as they travel up to a high altitude, yet birds have the high altitude record of 30,000 feet and do not use this compound (p. 62).

The fictional characters also discover other problems with evolution, including the fossil record, the long metamorphosis history of biological evolutionary views dating back to ancient Greece, and Haeckel's embryo forgery debacle.

The first part of the novel establishes the main character and the events that shape his life as he struggles to find the truth in his studies of biology. Many of the accounts in this section are similar to my own teaching experience before I moved on to the college level.

In conclusion, the author does an excellent job of creatively showing why so many people reject evolution by effectively presenting some of the major problems of Darwinism in a novel format. In the end, scholarship and true science triumph and the hero wins the heroine in an anti-Hollywood, spirit-over-temptations style. The book also points out that every living and nonliving element in the universe is an original, which makes evolution even more impossible than all the other evidences against it.

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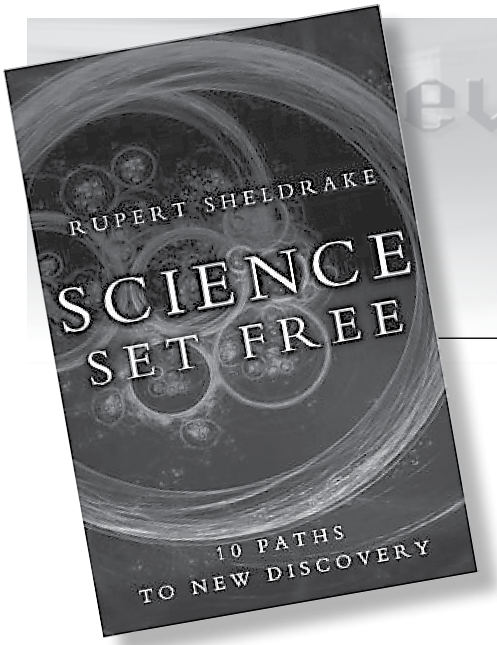

Science Set Free: 10 Paths to New Discovery

by Rupert Sheldrake

Deepak Chopra Books, New York, 2012, 390 pages, $26.00.

Rupert Sheldrake is a British biologist and author. For the past thirty years, he has promoted a hypothesis of *morphic resonance* and has critiqued the materialistic foundation of modern science. The mainstream scientific community has generally shunned his ideas as pseudo-science, and his views have gained little support.

Morphic resonance, according to Sheldrake, is an invisible, nonmaterial phenomenon that cannot be directly observed. Sheldrake believes that morphic fields exist which, among other things, can explain personal memories, atavism, purposeful evolution, and various psychic phenomena. Like other fields in nature (e.g., gravitational, electrical, and magnetic), morphic fields are made evident only by their effects on matter, especially living organisms. Information (thoughts, memories, messages) are transferred back and forth between living organisms and the morphic fields by morphic resonance. Morphic resonance is said to extend beyond space and time.

Sheldrake's newest book summarizes much of his earlier work and expands his critique of materialism. The book was first published in the UK with the title *The Science Delusion: Freeing the Spirit of Enquiry*. This mimics the 2006 book title by British atheist Richard Dawkins, *The God Delusion*. Dawkins has been a frequent critic of Sheldrake's ideas.

Sheldrake's central premise in *Science Set Free* is that "science is being held back by centuries-old assumptions that have hardened into dogmas" (p. 6). Science would make greater progress, he says, by abandoning these dogmas and considering new possibilities. "The biggest scientific delusion of all is that science already knows the answers" (p. 6), that some details need to be worked out, but basically all the key questions have been answered.

The main problem is that modern science "is based on the claim that all reality is material or physical" (p. 6). Materialism (or naturalism) became established as a science paradigm in the late nineteenth century. "Many scientists are unaware that materialism is an *assumption* [emphasis added]: they simply think of it as science or the scientific view of reality, or the scientific worldview" (p. 8). Sheldrake believes that materialistic science is losing its grip as a paradigm and that in the future the rejection of materialism (or methodological naturalism) will liberate science so that new advances may be made.

Sheldrake devotes most of his book to describing the materialistic assumptions of science and providing evidence that they are false. He states: "It is not anti-scientific to question established beliefs, but central to science itself. At the creative heart of science is a spirit of open-minded inquiry" (p. 25). Some of Sheldrake's thoughts on the core beliefs of science are summarized here.

Belief #1: "Everything is essentially mechanical" (p. 7). This is the "machine metaphor," the belief that the universe (including plants and animals) is mechanical in nature with no purpose. Sheldrake prefers to look at the universe as a "growing, developing organism" (p. 55). This kind of organism is not mechanical. "Organisms are self-organizing; they form and maintain themselves, and have their own ends or goals" (p. 28).

Belief #2: "All matter is unconscious" (p. 7). Materialism assumes that "consciousness is an emergent physical property of brains" (p. 113). The traditional theory opposing materialism is dualism, which separates the human being into two parts: the body (material) and the soul (mental). Sheldrake proposes a third possibility, that "all self-organizing material systems have a mental as well as a physical aspect" (p. 128). That is, consciousness is not material but is an inherent feature in living organisms.

Belief #5: "Nature is purposeless, and evolution has no goal or direction" (p. 7). "Most biologists are split between a practical acceptance of teleology or teleonomy, and a rejection of it in the interests of mechanistic ideology" (p. 132). That is, while living organisms appear to show design or purpose, materialists believe this is only an illusion. Sheldrake proposes a different view based on self-organization. "Self-organizing systems have their own ends or goals, attractors toward which they move. All living organisms show goal-directed development and behavior" (p. 156).

Belief #8: "Memories are stored as material traces in brains and are wiped out at death" (p. 8). The materialistic theory that memories are stored in the brain has never been verified by experiments. Sheldrake proposes that "we do not carry our memories around inside our heads" (p. 199). Instead, memories are stored in morphic fields and are transferred back and forth from the body by morphic resonance.

Belief #9: "Unexplained phenomena such as telepathy are illusory" (p. 8). Sheldrake points to psychic phenomena (telepathy, precognition, premonition) for evidence that thoughts and memories reside in morphic fields outside of the body and can be transferred nonmaterially to others.

Belief #10: "Mechanistic medicine is the only kind that really works" (p. 8). Materialistic medicine posits that only drugs and surgery can lead to successful treatment of illnesses and injuries. Sheldrake says that alternative treatments can often yield positive results. He points to studies showing that "people who pray or meditate tend to be healthier and live longer than those who do not" (p. 290). Alternative treatments (homeopathy, naturopathy, acupuncture, and chiropractic) have documented histories of success in many cases. Patients who are given placebos (when they think they have been given real drugs) often show positive responses. Sheldrake believes that an "integrative medical system," incorporating both conventional and alternative treatments, will lead to better overall success.

The question for us to consider is whether Sheldrake's critique of materialism in science is helpful or harmful to supporters of creation and design. To begin with, Sheldrake is neither a biblical creationist nor a proponent of intelligent design. "The problem with the design argument," he says, "is that the metaphor of a designer presupposes an external mind. ... Yet we are not forced to choose between chance and an external intelligence. There is another possibility. Living organisms may have an internal creativity, as we do ourselves" (p. 37). In short, Sheldrake does not believe in God as an external spiritual entity who is separate from his creation. Instead, Sheldrake has described his view as panentheistic (not pantheistic). God is in every part of nature; He is the eternal, animating force behind the universe.

In the panentheistic view, there is creativity and purposefulness in nature itself. Sheldrake says that "God imbued the natural world with creativity" (p. 339). Sheldrake is certainly an "evolutionist," but not in the sense of strict materialistic evolution. Sheldrake proposes a "radically evolutionary view of nature [which] implies an ongoing creativity, establishing new habits and regularities as nature evolves. Human creativity is part of a vast creative process that has been unfolding through the whole of evolution" (p. 107).

Sheldrake professes to be a Christian (Anglican). Panentheism can be a feature of some Christian thought, such as Eastern Orthodoxy and process theology. Sheldrake's God does not, however, have all the attributes of the God of the Bible. Scripture portrays God as the Creator who is distinct from His creation. He is the triune Deity that has made man in His image and who has a personal and caring relationship with each of us who professes faith in Him. He is incarnated in Jesus, who offers us salvation and eternal life through Him. It is difficult to find any of these key attributes in Sheldrake's view of God.

An old proverb states that "the enemy of my enemy is my friend." Materialism is the enemy for both creationists and Sheldrake, but does that make him our friend? We can applaud anyone who helps to tear down the paradigm of materialism. However, we must be cautious about alternatives like morphic resonance, a hypothesis that is inconsistent with a creationist view of God.

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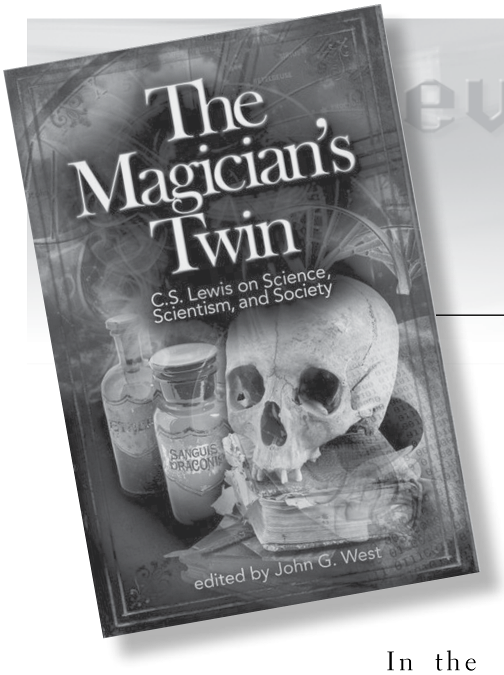

The Magician's Twin

John G. West and P. E. Johnson, Editors

Discovery Institute Press, 2012, 350 pages, $24.95.

In the world of Christian apologetics, C. S. Lewis stands almost without peer. While Lewis might not be as deeply philosophical as more modern apologists, he had a knack for explaining things in a way "every man" can understand, a way of communicating that takes the argument into the court of those opposed to Christian belief. At the same time, however, Lewis's theology has often left many in the church with large doubts about the depth and richness of his Christian belief.

Evolution is one of the areas where Lewis is often criticized. His commitment to the literal accuracy of the Scriptures is in great doubt, and he seems to have supported evolution in many of his writings. This present work, *The Magician's Twin*, is a defense of Lewis in the form of a *festschrift*, an apology for a great apologist.

The defense of Lewis presented here hinges on placing evolution within the larger context of Lewis's thinking on science and scientism. While he didn't directly address science or scientism in any major work, Lewis had a lot to say on the topic of how we see science in our everyday lives, especially in the *Out of the Silent Planet* series, and this thinking directly impacts the way Lewis viewed evolutionary thought.

John G. West begins the book with an essay discussing the way in which Lewis dealt with science in magic. In Lewis's view, science is "the magician's twin," an endeavor by man to control nature. Rather than relying on controlling the "elemental spirits," however, science attempts to discover the order of nature itself in order to produce goods that are useful to the human (even if the specific good is only the satisfying of curiosity). The difference, then, is really one of method rather than goals or aims, and it is the goals or aims of science that can be problematic rather than the methods.

The first chapter sets the stage not only for the book but also for the first section, which deals with science and scientism. The second essay deals with Lewis's definition of science and how he contrasted that definition with scientism, the making of science itself into a god. Here Lewis's fundamental problem with science as the end of all thought comes to the fore. If we are simply the result of material causes, then why should we trust our thoughts about our thoughts? How can we trust one material cause to explain another material cause accurately?

Edward Larson's essay, "C. S. Lewis on Science as a Threat to Freedom," explores the interesting intersection of treating all causes as materialistic and also the idea of human freedom, particularly in light of the various scientific societies in vogue at the time Lewis lived, including the communist Soviet Union. Continuing the book section, Jake Akins shreds the idea that those "religious divines" in the Middle Ages were somehow against all scientific thought, or that magic reigned supreme. The final chapter in this section, by C. John Collins, addresses Lewis's thought from the perspective of the philosophy of science.

"Origins," the second section of *The Magician's Twin*, deals directly with Lewis's thought on evolution. In "Darwin in the Dock," John G. West considers Lewis's view of the Darwinian idea. While Lewis began by accepting evolution as a theory, West shows that he backed away from this acceptance over his lifetime, eventually expressing a good deal of doubt about the theory. West continues in this section by considering the support Lewis provided for intelligent design through his writings.

"Reason," the third section, begins by considering the importance of Lewis's ability to communicate his ideas on science and scientism. His role as an interpreter between the philosophical and the common worlds can hardly be overestimated. Jay W. Richards, in his chapter, considers the interplay between Plantinga's apologetic for the existence of God and Lewis's fundamental critique of naturalistic thought, essentially two sides of the same coin. In the second chapter in this section, "C. S. Lewis' Dangerous Idea Revisited," Victor Reppert examines Lewis's argument against materialism, specifically refuting several popular arguments against it.

While the first three sections of this book are of great interest, it is the fourth section, "Society," which will prove to be a classic collection in the area of science and scientism. Here James A. Herrick discusses how scientism interacts with the post-human ideas now forming in our culture, an important and often overlooked part of our everyday lives. Cameron Wybrow traces the life of the character Mark Studdock through Lewis's space trilogy, showing how Lewis's education is a contrast to the character of Frost. As Studdock becomes human, Frost becomes less human. Together, the two of them illustrate the danger of scientism in the lives of everyday people.

In the penultimate chapter, M. D. Aeschliman compares Lewis to Theodor Haecker, an anti-Nazi who lived in the same time period. This comparison is instructive in the light it throws on the material a culture provides for its educational system and the results in the life of the nation. The final chapter develops this same theme further, specifically in terms of *The Abolition of Man*.

Even for those who do not accept evolution as a theory of life's formation, as C. S. Lewis apparently did early in his Christian walk, this collection of essays lays out the argument against evolution as a component of scientism in a well-organized and well-thought-out manner. It is required reading for anyone who treads the path of understanding the relationship of science and faith and their impact on individuals and culture at large.

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RAY COMFORT & JEFFREY SETO
Made in
HEAVEN
Man's Indiscriminate Stealing of God's Amazing Design

Made in Heaven

by Ray Comfort and Jeffrey Seto

Master Books, Green Forest, AR, 2012, 78 pages, $16.00.

This book gives 32 examples of practical designs in nature with full-color illustrations. The topic is *biomimicry*, the development of new products and solutions to technical problems inspired by nature. Book discussion includes shark scales, the human eye, mosquitos, gecko feet, and kingfisher birds.

The book subtitle is *Man's Indiscriminate Stealing of God's Amazing Design*. I take issue with this phrase and suggest that practical designs in nature are gifts for mankind to search out and apply. The results include modern medicine, materials transportation, and technology—in short, our entire way of life.

Each of the design examples in this book are also described in *Discovery of Design* by the same publisher (DeYoung and Hobbs, 2009) and *By Design* (Sarfati, 2008). There are also comprehensive creationist databanks of design applications from nature. See, for example, DiscoveryofDesign.com and creation.com/biomimetics. In addition, there are regular biomimicry features in the *Answers Magazine*. Surprisingly, these additional supporting resources are not referenced or mentioned in *Made in Heaven*.

Author Ray Comfort's website is livingwaters.com. He has popularized a confrontational approach to evangelism whereby listeners are brought face to face with their complete failure to live by the Ten Commandments. Ray's personal testimony is included in the conclusion of the book. Coauthor Jeffrey Seto holds an undergraduate degree in engineering. His expertise in aerospace is shown in the book's discussions of flight.

Several technical topics are introduced with detailed drawings. They include vortex generation (p. 8), circular polarization of light (p. 21), and strain gauges (p. 41). However, these topics are not developed to the point of clear understanding. *Made in Heaven* gives a good discussion of the hydrologic cycle, including hydrothermal vents and snowflakes. There is a short glossary of biomimicry terms; no index is provided.

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Media Reviews

Giants against Evolution

by Joe Taylor

Mt. Blanco Publishing Co.,
2012, 204 pages, $39.00.

This book is a compendium of information about giants of all types. The book is divided into two major sections. The first is titled "The Problem with Giants—Giant Humans are a threat to old- fashioned Evolutionism," and the second is "Giant Animals—Giant Animals are a Threat to Evolutionism."

Author Taylor examines giantism in the biblical record, especially in Genesis 6. He points to the giants (KJV), or *nephilim*, and gives arguments for the two major positions regarding the sons of God producing offspring with the daughters of men. One theory is that the sons of God were the righteous descendants of Seth who married into the sinful lineage of Cain. The second theory (which Taylor supports) is that the sons of God were fallen angels, and he cites evidence from the apocryphal Book of Enoch and classic Greek mythology, as well as Scripture. Taylor connects the sons of God to current UFO and conspiracy theories (pp. 10–20). A third view, not considered, contends that the sons of God were demonized humans who married antediluvian women.

The second part of the book dealing with giant animals is probably the most rewarding in that the creatures discussed are readily available in museums. This also taps well into Taylor's own expertise as a vertebrate field paleontologist and fossil restorationist. Taylor shares brief accounts of some digs he has participated in which lend credibility to the discussion.

One of Taylor's major contentions is that evolution postulates that life is becoming ever increasingly complex and larger in body size. He harkens back to the linear progression diagrams in older textbooks that depict creatures following an evolutionary path from smaller to larger (horses, men, titanotheres, elephants, and camels, pp 188–194). This size factor, called Cope's Rule, has fallen out of favor, but may be making a comeback in some evolutionary circles (Zimmer, 2004). One of the main contentions of Taylor's book is, if evolution were true, why is the fossil record filled with so many giant creatures of all types?

Perhaps the main problem with fossil remains of giant humans (unlike dinosaurs, ancient sea reptiles, and Megafauna mammals) is that there are so few available for study. The book is filled with numerous discovery reports of giant human remains, but very few are currently accessible to forensic scientists or the general public. A rare exception is the Lovelock, Nevada, giants at the Humboldt Museum in Winnemucca, Nevada (pp. 58–59).

Taylor suggests several considerations for the comparative lack of accessible physical evidence for ancient human giantism. Commenting on a 1881 newspaper report of finding a petrified 13-foot man, Taylor notes, "Unfortunately, like all the hundreds of other giant men found while digging by hand in the 1800s, the ability to preserve or store them was inadequate or they were obtained by curiosity seekers and eventually destroyed or ended up in major museum basements and forgotten" (p. 36). Taylor maintains that the reason for the lack of these fossils on public display is that giant men do not fit the evolutionary story. In Taylor's mind, giants would harken back to the reliability of the Bible with its accounts of giants, which evolutionary scientists do not wish to credit (p. 51).

The major strength of this book is that it presents a vast amount of information on the topic of human and animal giantism. Taylor has dedicated much of the last decade accumulating a wealth of data concerning this fascinating area of study.

The major weakness of Taylor's book is that much of the material is anecdotally based, or hearsay. Many of the entries do not have references that could lead the reader to the original source material. On a subject as controversial as ancient human giantism, this is an important consideration.

Is it possible to deal with those types of evidences? The major problem is not so much the evidence presented but how it is handled. There is a mixing of good evidence with that which is weak. More systematic editing would have placed reports with lesser authentication in special sections or appendices or endnotes.

This book's major problem is one of organization of material. Taylor tosses much into this potpourri of a book—some with solid thinking and good evidence but mixed with less substantial information. This reviewer has nothing against examining even "way-out" theories, but they should be placed in a proper context. The author acknowledges that some of the data is hard to accept. To Taylor's credit, he does include a valuable chapter on giant hoaxes and frauds (pp. 180–186).

This book is an important contribution to the study of biblical giantism and is a storehouse of information for future researchers to pursue this unusual theme. This book contains an index and many photos, illustrations, and charts.

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T is for T.Rex

by T. P. Beh

Clouds of Light Publications, Castle Rock, CO, 2013, 62 pages, $20.00.

T. P. Beh is a professional writer living in Colorado, as well as a creationist dinosaur fossil digger with excavation experience in several states. He has developed a concept for teaching the basics of fossils (especially dinosaurs) to young children from a creation perspective. Beh engages children's fascination with dinosaurs and other ancient creatures and gives them an incentive to learn more about these amazing creatures along with their ABCs.

Beh partnered with illustrator Daniel Sorensen to produce this full-color book. Sorensen's illustrations are cartoons that show dinosaurs in humorous situations, like Jaxartosaurus with a boy playing a game of jacks, and a Dimetrodon, a so-called mammal-like reptile, telling a camel he is not his grandpa. There are also small silhouette drawings that show the comparative size of these animals compared to an average person. Besides dinosaurs, flying reptiles, marine reptiles, massive amphibians, fish, whales, and megafauna mammals are also included. Beh's book is easy to read and contains creation concepts such as these fossils being buried in the Genesis Deluge, a post-Flood Ice Age, and possible biblical descriptions of these animals. He explains the discovery of soft tissue of dinosaurs, as well as where these fossils are found, how their names are pronounced, along with their meanings, and possible modern-day sightings.

I missed entries for some of my favorites, including Triceratops, Ankylosaurus, and Pachycephalosaurus, although Beh does mention them in passing. Each alphabet letter gets only one entry, so perhaps these worthies will make it into the next book. This hardbound volume will endure numerous readings and contains a conclusion, short biographies of Beh and Sorensen, and a list of creation-oriented dinosaur and fossil digs (a great summer family vacation idea). This book is appropriate for kindergarten through grade 3.

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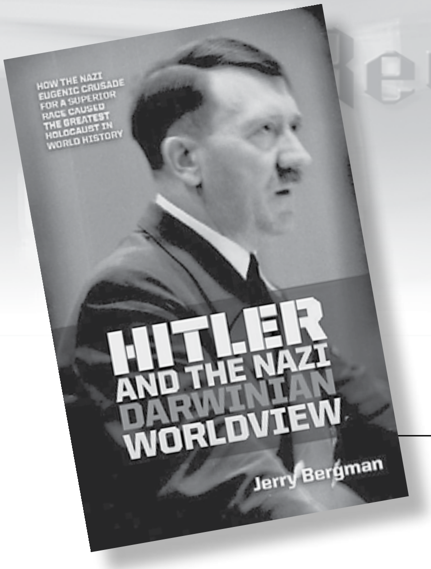

Hitler and the Nazi Darwinian Worldview: How the Nazi Eugenic Crusade for a Superior Race Caused the Greatest Holocaust in World History

by Jerry Bergman

Joshua Press, Kitchener, Ontario, 2012, 356 pages, $26.00.

Adolph Hitler and his top Nazi leaders were products of German education, science, and the prevailing social worldview of the late nineteenth and early twentieth century. Their participation in what was one of the most infamous episodes of human suffering and death in the history of the human race probably could have been predicted. The preceding statement should not be taken as an attempt to absolve them of the crimes and suffering that became known as the Holocaust, not just against the Jews, but also against the races and ethnic groups that were considered inferior to the Nazi-favored Aryan race. In fact, Jews amounted to only slightly more than half of the 11 million people directly murdered by the Nazi state as part of the Holocaust (p. 21).

Hitler stands out against a hazy German background of evolutionary thought, Darwinist teaching, and eugenic science. And much like the famous precision-engineered German optics, Hitler was the lens that bent the rays of social Darwinism to a searing focus. Lest we forget, author Bergman also reminds us that both America and Britain participated in the anti-Semitism that was rampant in the twentieth century (p. 161 and chapter 16). This was apparent even after the war, as indicated by the highly acclaimed 1947 Hollywood movie, *Gentleman's Agreement*, which dealt with the various forms and results of anti-Semitism rampant in America at that time (Zanuck, 1947).

The German education system of the era in which Hitler and his henchmen grew up was steeped in Darwinism and the concept of eugenics, the inequality of races and peoples (pp. 47, 108ff). The German scientists who performed the research and directed the teaching of evolution enthusiastically supported this educational system, the products of which became the Nazi leaders who established and promoted the racial policies of the Nazi state (chapter 16). As the Nazi concept of a master race infused the education system, the emphasis turned to eugenics: cleansing society of the undesirable characteristics of the "lower" races (negative eugenics) and promoting selective breeding to enhance the desired characteristics (positive eugenics). The importance of the educational system in assisting the state to control the thinking of the young citizens is well documented in the book. Hitler understood this well, as exemplified by a statement attributed to him: "Let me control the textbooks and I will control the state" (p. 265). This quote should strike a cacophonous chord among those involved in the current creation/evolution debate.

It is interesting to note that many of the future Nazi leaders had a history of hatred based on the social Darwinism worldview even before the era of Nazi power. Their beliefs were rooted in early schooling, and some were decent men. Hermann Göring (p. 207), Joseph Goebbels (p. 192), and Heinrich Himmler (p. 178) were changed later in life by their association with Hitler and the Nazi power elite. Most of the Nazi leaders did not fit the description of the "ideal" blond, blue-eyed Aryan, and many were even suspected of having Jewish ancestry (p. 226). This made their promotion of the Nazi racial policies somewhat ironic. In fact, their policies can only be justified by Göring's famous statement, "*Wer Jude ist, bestimme ich*" ("I will decide who is a Jew"; p. 212), and not by any reasonable biological means. Genetics was still in its infancy, and DNA was decades away from discovery and decoding.

A number of parallels and warnings are described for America and England. Bergman appropriately mentions the oft-used quote by historian George Santayana about ignoring the lessons of history and repeating them (p. 125). Bergman makes a point that the parallel of the "weaning of Americans from Christianity by banning public display of Christian symbols and ritual is remarkably reminiscent of what Nazi Germany did" (p. 16). In general, the German church's abandonment of both biblical Christianity and its role in politics is noted as a parallel to the situation in America today (p. 74). Bergman provides examples in chapter 17, descriptively titled, "What can be learned from attempts to apply Darwinism to society."

There are three sections in the book, although the table of contents does not specifically show them. Chapters 1–6 provide the background of Darwinism and eugenics before the Nazi regime and discuss Hitler's background and worldview. Chapters 7–14 provide biographies of eight of the important figures of Hitler's Nazi engine, with an emphasis on their background in Darwinism and eugenics. Chapters 15–17 provide additional material on the applications of Darwinism to the Nazi breeding program, the handling of Darwinism in the textbooks used in the schools of Nazi Germany, and the lessons we can learn from this history.

Chapter 16, titled "Darwinism in the Biology Textbooks of the Third Reich," is a bit confusing. It contains 15 figures that show various depictions of the evolution of the races of man and primates gleaned from various sources. Thirteen of them were published in America or Britain, and several are from the post-WW II era, making their significance to the topic of the chapter elusive. While interesting, they would have been more meaningful if context for the figures was provided in the text. The book also lacks an index, which would be a useful addition; there is an extensive bibliography.

I was eager to read this book since, in my younger days, I was quite a World War II history buff. At that time I focused exclusively on the military technology and political aspects of the war and the international events leading up to it. A social and scientific history of the Third Reich was a gap in my knowledge that I hoped this book would help to fill, and it has. Including the 11 million people of "inferior races," the total dead attributed to the war is 55 million (p. 21). I believe the number may be considerably higher if the vengeful post-war atrocities committed upon the German people by the Allies are added (Bacque, 2007). Social Darwinism, as applied "scientifically" in the Third Reich, is an important lesson that we in the twenty-first century would do well to heed.

References

Bacque, James. 2007. *Crimes and Mercies: The Fate of German Civilians under Allied Occupation 1945–1950*. Talonbooks, Vancouver, BC.

Zanuck, Darrell F. (producer). 1947. *Gentleman's Agreement*, 20th Century Fox Film. See also http://imdb.com/title/tt0039416/.

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Captured in Atlantis: Bound Together: A Time Twins Adventure

by D. B. Macks

Self-published, 290 pages,
Kindle edition $2.99.

Two teenagers time-travel between the twenty-first century and the pre-Flood world with the help of a physics genius uncle and several relatives of Seth (the son of Adam). The antediluvian humans have powers that we might label "super" and also have a highly advanced society. The book's common thread is the struggle between good and evil and the need for intervention by those who trust in the Creator and follow His leading. This novel includes adventure, danger, and personal growth.

Imagine a book with elements of Narnia, *The Screwtape Letters*, Middle Earth, *Pilgrim's Progress*, *Star Wars*, and *Gulliver's Travels*. By the use of biblically grounded imagination, some elements of New Age thinking, such as auras and crystals, are portrayed in an original, unspoiled form as part of the original creation. Also present are levitation, transfer of memories, communication with animals, existence of dragons as talking beings (both good and some evil), and the possibility of travel to Mars because of periodic close passes with merging atmospheres. There is a glow that comes from living plants and sounds that somehow come from the stars.

In Seth's pre-Flood world, everyone's thoughts are open to viewing by others. People grow up intuitively understanding the danger in nurturing wrong thoughts. Nephilim are real, unimaginably evil, and physically and spiritually powerful. They are able to distort animals into monstrous parodies of the original creation and to plant thoughts in human beings who are twisted into either victims or perpetrators of evil.

The two fourteen-year-old boys, who are friends from their first meeting, which was supposed to be a summer visit, become tightly linked as mental twins, something rare even in the pre-Flood world. They enter each other's dreams and criticize each other's weaknesses, but they also see the possibility of supporting each other in difficulties. When on a mission to the endangered chief city of the pre-Flood world, they pass through an area controlled by Nephilim specializing in lust. Of the entire party, the boys are the most vulnerable because of their age. But from the wise elders they receive a powerful concept that is worthy of widespread promotion in our own degenerate world: Love overcomes lust. Lust should be flooded out by love, which comes originally from the Creator, who values all His beings and is reflected by all who truly follow Him.

Teens and adventure-loving adults will enjoy this book, whether they see it as pure fantasy or speculative history. It opens up many possibilities for creative thinking about the pre-Flood world.

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Instructions to Authors

Submission

Electronic submissions of all manuscripts and graphics are preferred and should be sent to the editor of the *Creation Research Society Quarterly* in Word, WordPerfect, or Star-Office/Open Office (see the inside front cover for address). Printed copies also are accepted. If submitting a printed copy, an original plus two copies of each manuscript should be sent to the editor. The manuscript and copies will not be returned to authors unless a stamped, self-addressed envelope accompanies submission. If submitting a manuscript electronically, a printed copy is not necessary unless specifically requested by the *Quarterly* editor. Manuscripts containing more than 35 pages (double-spaced and including references, tables, and figure legends) are discouraged. An author who determines that the topic cannot be adequately covered within this number of pages is encouraged to submit separate papers that can be serialized.

All submitted manuscripts will be reviewed by two or more technical referees. However, each section editor of the *Quarterly* has final authority regarding the acceptance of a manuscript for publication. While some manuscripts may be accepted with little or no modification, typically editors will seek specific revisions of the manuscript before acceptance. Authors will then be asked to submit revisions based upon comments made by the referees. In these instances, authors are encouraged to submit a detailed letter explaining changes made in the revision, and, if necessary, give reasons for not incorporating specific changes suggested by the editor or reviewer. If an author believes the rejection of a manuscript was not justified, an appeal may be made to the *Quarterly* editor (details of appeal process at the Society's web site, www.creationresearch.org).

Authors who are unsure of proper English usage should have their manuscripts checked by someone proficient in the English language. Also, authors should endeavor to make certain the manuscript (particularly the references) conforms to the style and format of the *Quarterly*. Manuscripts may be rejected on the basis of poor English or lack of conformity to the proper format.

The *Quarterly* is a journal of original writings, and only under unusual circumstances will previously published material be reprinted. Questions regarding this should be submitted to the Editor (CRSQeditor@creationresearch.org) prior to submitting any previously published material. In addition, manuscripts submitted to the *Quarterly* should not be concurrently submitted to another journal. Violation of this will result in immediate rejection of the submitted manuscript. Also, if an author uses copyrighted photographs or other material, a release from the copyright holder should be submitted.

Appearance

Manuscripts shall be computer-printed or neatly typed. Lines should be double-spaced, including figure legends, table footnotes, and references. All pages should be sequentially numbered. Upon acceptance of the manuscript for publication, an electronic version is requested (Word, WordPerfect, or Star-Office/Open Office), with the graphics in separate electronic files. However, if submission of an electronic final version is not possible for the author, then a cleanly printed or typed copy is acceptable.

Submitted manuscripts should have the following organizational format:

1. Title page. This page should contain the title of the manuscript, the author's name, and all relevant contact information (including mailing address, telephone number, fax number, and e-mail address). If the manuscript is submitted by multiple authors, one author should serve as the corresponding author, and this should be noted on the title page.

2. Abstract page. This is page 1 of the manuscript, and should contain the article title at the top, followed by the abstract for the article. Abstracts should be between 100 and 250 words in length and present an overview of the material discussed in the article, including all major conclusions. Use of abbreviations and references in the abstract should be avoided. This page should also contain at least five key words appropriate for identifying this article via a computer search.

3. Introduction. The introduction should provide sufficient background information to allow the reader to understand the relevance and significance of the article for creation science.

4. Body of the text. Two types of headings are typically used by the *CRSQ*. A major heading consists of a large font bold print that is centered in column, and is used for each major change of focus or topic. A minor heading consists of a regular font bold print that is flush to the left margin, and is used following a major heading and helps to organize points within each major topic. Do not split words with hyphens, or use all capital letters for any words. Also, do not use bold type, except for headings (italics can be occasionally used to draw distinction to specific words). Italics should not be used for foreign words in common usage, e.g., "et al.", "ibid.", "ca." and "ad infinitum." Previously published literature should be cited using the author's last name(s) and the year of publication (ex. Smith, 2003; Smith and Jones, 2003). If the citation has more than two authors, only the first author's name should appear (ex. Smith et al., 2003). Contributing authors should examine this issue of the *CRSQ* or consult the Society's web site for specific examples as well as a more detailed explanation of manuscript preparation. Frequently-used terms can be abbreviated by placing abbreviations in parentheses following the first usage of the term in the text, for example, polyacrylamide gel electrophoresis (PAGE) or catastrophic plate tectonics (CPT). Only the abbreviation need be used afterward. If numerous abbreviations are used, authors should consider providing a list of abbreviations. Also, because of the variable usage of the terms "microevolution" and "macroevolution," authors should clearly define how they are specifically using these terms. Use of the term "creationism" should be avoided. All figures and tables should be cited in the body of the text, and be numbered in the sequential order that they appear in the text (figures and tables are numbered separately with Arabic and Roman numerals, respectively).

5. **Summary.** A summary paragraph(s) is often useful for readers. The summary should provide the reader an overview of the material just presented, and often helps the reader to summarize the salient points and conclusions the author has made throughout the text.

6. **References.** Authors should take extra measures to be certain that all references cited within the text are documented in the reference section. These references should be formatted in the current *CRSQ* style. (When the *Quarterly* appears in the references multiple times, then an abbreviation to *CRSQ* is acceptable.) The examples below cover the most common types of references:

Robinson, D.A., and D.P. Cavanaugh. 1998. A quantitative approach to baraminology with examples from the catarrhine primates. *CRSQ* 34:196–208.

Lipman, E.A., B. Schuler, O. Bakajin, and W.A. Eaton. 2003. Single-molecule measurement of protein folding kinetics. *Science* 301:1233–1235.

Margulis, L. 1971a. The origin of plant and animal cells. *American Scientific* 59:230–235.

Margulis, L. 1971b. *Origin of Eukaryotic Cells*. Yale University Press, New Haven, CT.

Hitchcock, A.S. 1971. *Manual of Grasses of the United States*. Dover Publications, New York, NY.

Walker, T.B. 1994. A biblical geologic model. In Walsh, R.E. (editor), *Proceedings of the Third International Conference on Creationism* (technical symposium sessions), pp. 581–592. Creation Science Fellowship, Pittsburgh, PA.

7. **Tables.** All tables cited in the text should be individually placed in numerical order following the reference section, and not embedded in the text. Each table should have a header statement that serves as a title for that table (see a current issue of the *Quarterly* for specific examples). Use tabs, rather than multiple spaces, in aligning columns within a table. Tables should be composed with *14-point type* to insure proper appearance in the columns of the *CRSQ*.

8. **Figures.** All figures cited in the text should be individually placed in numerical order, and placed after the tables. Do not embed figures in the text. Each figure should contain a legend that provides sufficient description to enable the reader to understand the basic concepts of the figure without needing to refer to the text. Legends should be on a separate page from the figure. All figures and drawings should be of high quality (hand-drawn illustrations and lettering should be professionally done). Images are to be a minimum resolution of 300 dpi at 100% size. Patterns, not shading, should be used to distinguish areas within graphs or other figures. Unacceptable illustrations will result in rejection of the manuscript. Authors are also strongly encouraged to submit an electronic version (.cdr, .cpt, .gif, .jpg, and .tif formats) of all figures in individual files that are separate from the electronic file containing the text and tables.

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Submission of letters regarding topics relevant to the Society or creation science is encouraged. Submission of letters commenting upon articles published in the *Quarterly* will be published two issues after the article's original publication date. Authors will be given an opportunity for a concurrent response. No further letters referring to a specific *Quarterly* article will be published. Following this period, individuals who desire to write additional responses/comments (particularly critical comments) regarding a specific *Quarterly* article are encouraged to submit their own articles to the *Quarterly* for review and publication.

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All book reviews should be submitted to the book review editor, who will determine the acceptability of each submitted review. Book reviews should be limited to 1000 words. Following the style of reviews printed in this issue, all book reviews should contain the following information: book title, author, publisher, publication date, number of pages, and retail cost. Reviews should endeavor to present the salient points of the book that are relevant to the issues of creation/evolution. Typically, such points are accompanied by the reviewer's analysis of the book's content, clarity, and relevance to the creation issue.

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Creation Research Society

History—The Creation Research Society was organized in 1963, with Dr. Walter E. Lammerts as first president and editor of a quarterly publication. Initially started as an informal committee of 10 scientists, it has grown rapidly, evidently filling a need for an association devoted to research and publication in the field of scientific creation, with a current membership of over 600 voting members (graduate degrees in science) and about 1000 non-voting members. The *Creation Research Society Quarterly* is a peer-reviewed technical journal. It has been gradually enlarged and modified, and is currently recognized as one of the outstanding publications in the field. In 1996 the *CRSQ* was joined by the newsletter *Creation Matters* as a source of information of interest to creationists.

Activities—The Society is a research and publication society, and also engages in various meetings and promotional activities. There is no affiliation with any other scientific or religious organizations. Its members conduct research on problems related to its purposes, and a research fund and research center are maintained to assist in such projects. Contributions to the research fund for these purposes are tax deductible. As part of its vigorous research and field study programs, the Society operates The Van Andel Creation Research Center in Chino Valley, Arizona.

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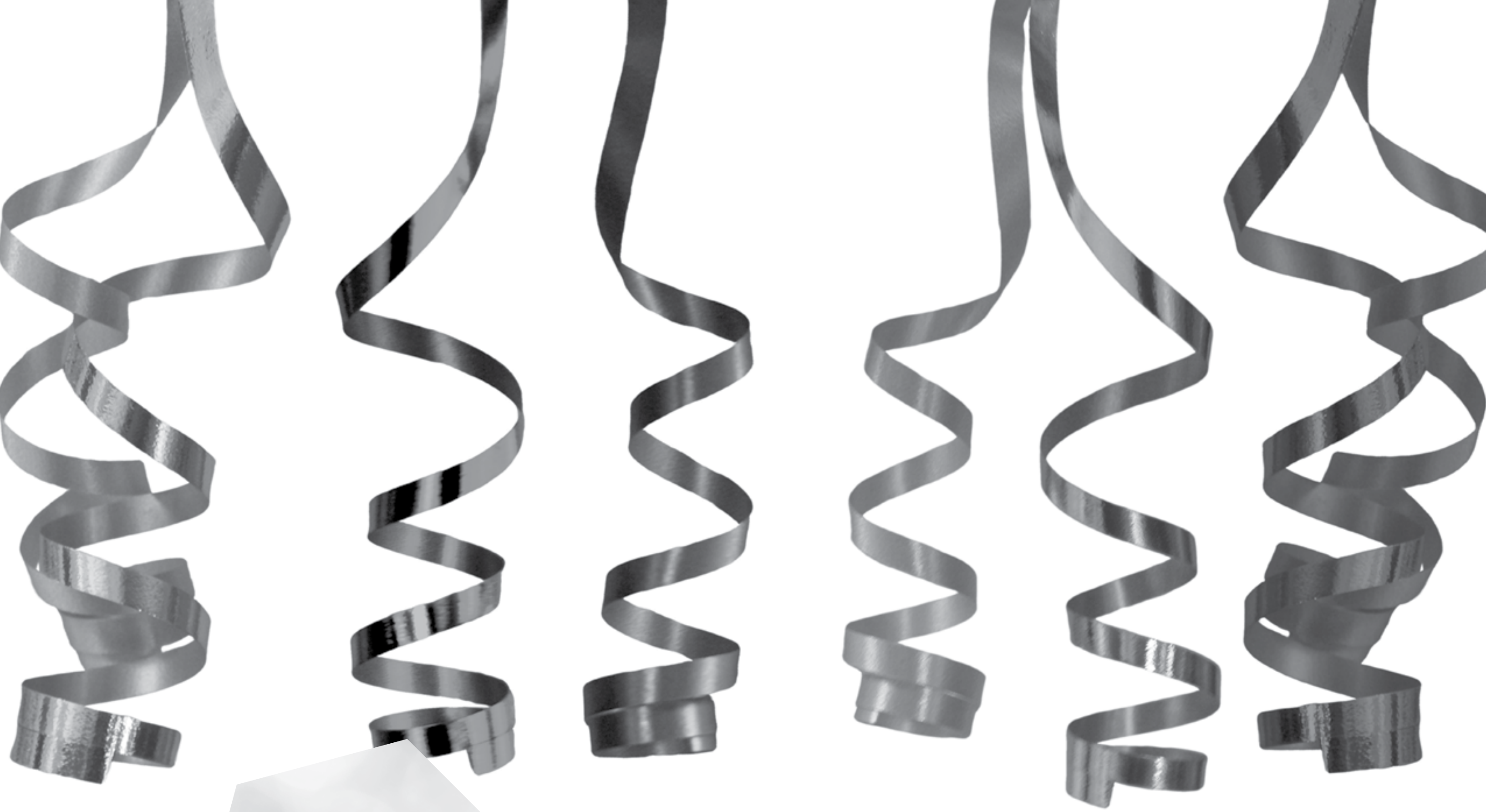
1. The Bible is the written Word of God, and because it is inspired throughout, all its assertions are historically and scientifically true in all the original autographs. To the student of nature this means that the account of origins in Genesis is a factual presentation of simple historical truths.
2. All basic types of living things, including humans, were made by direct creative acts of God during the Creation Week described in Genesis. Whatever biological changes have occurred since Creation Week have accomplished only changes within the original created kinds.
3. The Great Flood described in Genesis, commonly referred to as the Noachian Flood, was a historical event worldwide in its extent and effect.
4. We are an organization of Christian men and women of science who accept Jesus Christ as our Lord and Savior. The act of the special creation of Adam and Eve as one man and woman and their subsequent fall into sin is the basis for our belief in the necessity of a Savior for all people. Therefore, salvation can come only through accepting Jesus Christ as our Savior.



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